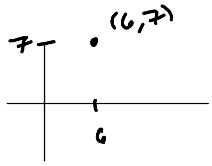
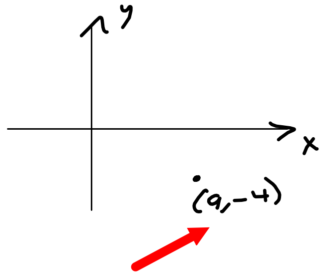
1. (a) The point that is 9 units to the right of the y-axis and 4 units below the x-axis has the coordinates $(x, y) =$ (9, −4)

(b) Is the point (6, 7) closer to the x-axis or the y-axis?

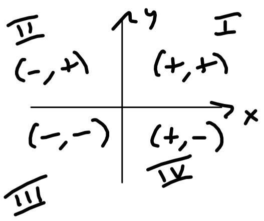
- ○ x-axis
- ○ y-axis



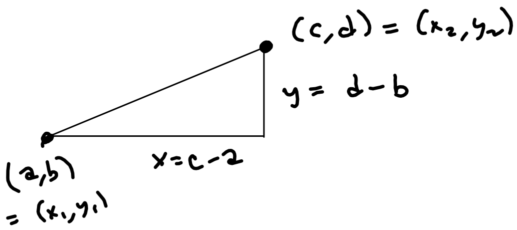


2. If x is negative and y is positive, then the point (x, y) is in Quadrant ? .

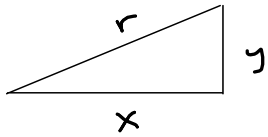
II



3 The distance between the points (a, b) and (c, d) is [ ] . So the distance between (5, 2) and (8, 6) is [ ] .

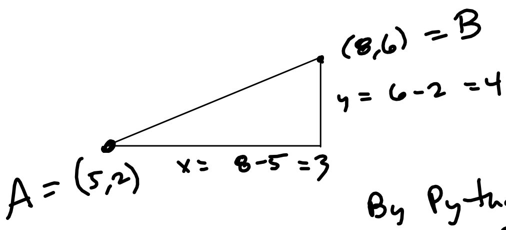


Pythagoras says:



$x^2+y^2=r^2$ $\longrightarrow$

$r=\sqrt{x^2+y^2}$ (Take the positive or PRINCIPAL square root)



By Pythagoras the distance

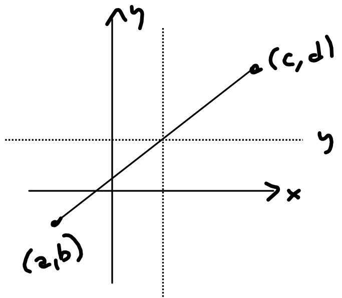
$d(A,B)=\sqrt{(c-a)^2+(d-b)^2}$ 1st part

$=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$=\sqrt{(8-5)^2+(6-2)^2}$

$=\sqrt{3^2+4^2} = \sqrt{9+16} = \sqrt{25} = 5$ 2nd part

4 The point midway between (a, b) and (c, d) is (x, y) = (   ). So the point midway between (3, 4) and (5, 6) is (x, y) = (   ).



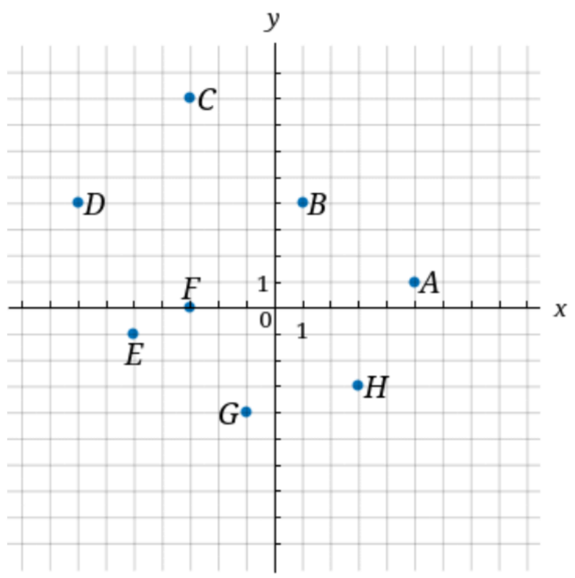
$y = \frac{b+d}{2}$

$x = \frac{a+c}{2}$

(3,4) & (5,6) midpoint is $\left(\frac{3+5}{2}, \frac{4+6}{2}\right) = \left(\frac{8}{2}, \frac{10}{2}\right)$
$= (4,5)$

$\Longrightarrow$ midpoint is $\left(\frac{a+c}{2}, \frac{b+d}{2}\right)$

Refer to the figure below.



Find the coordinates:

A

B

C

D

E

F

G

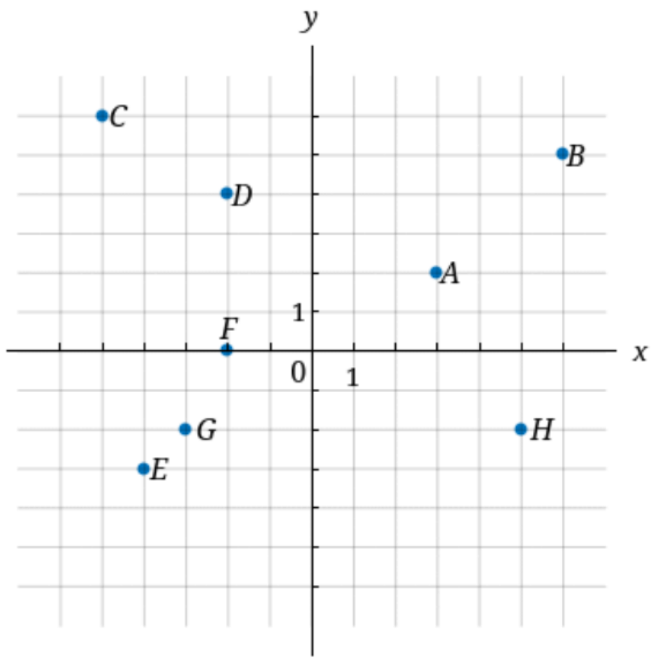
H

See video

05-06.mp4

6

Refer to the figure below.



Select the points that lie in Quadrant I. (Select all that apply.)

Points in Quadrant I:

A, B

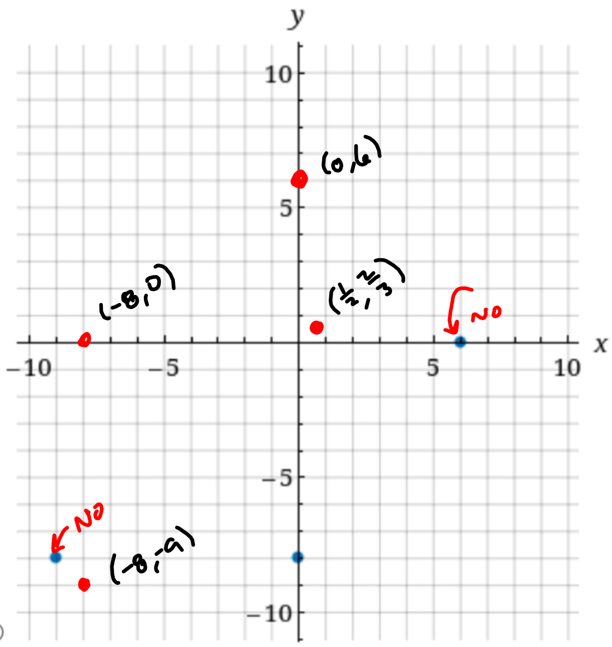
Points i Quadrant III

E, G

See 05-06.mp4

7 Plot the given points in a coordinate plane.

$(0, 6), (-8, 0), (-8, -9), \left(\frac{1}{2}, \frac{2}{3}\right)$



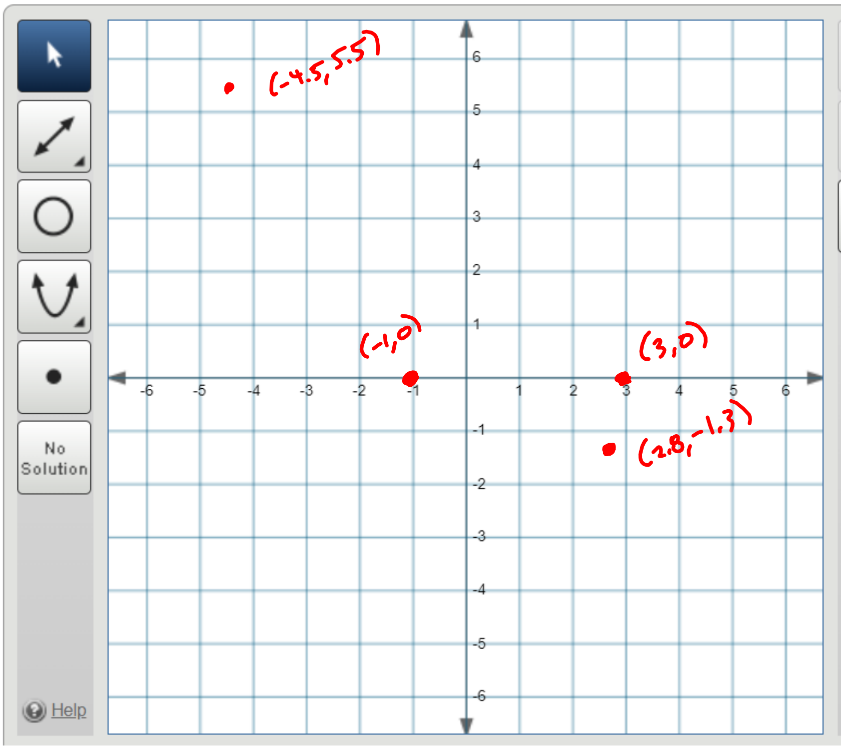
This is a multiple-choice question on WebAssign.

See 07.mp4

8

Plot the given points in a coordinate plane.

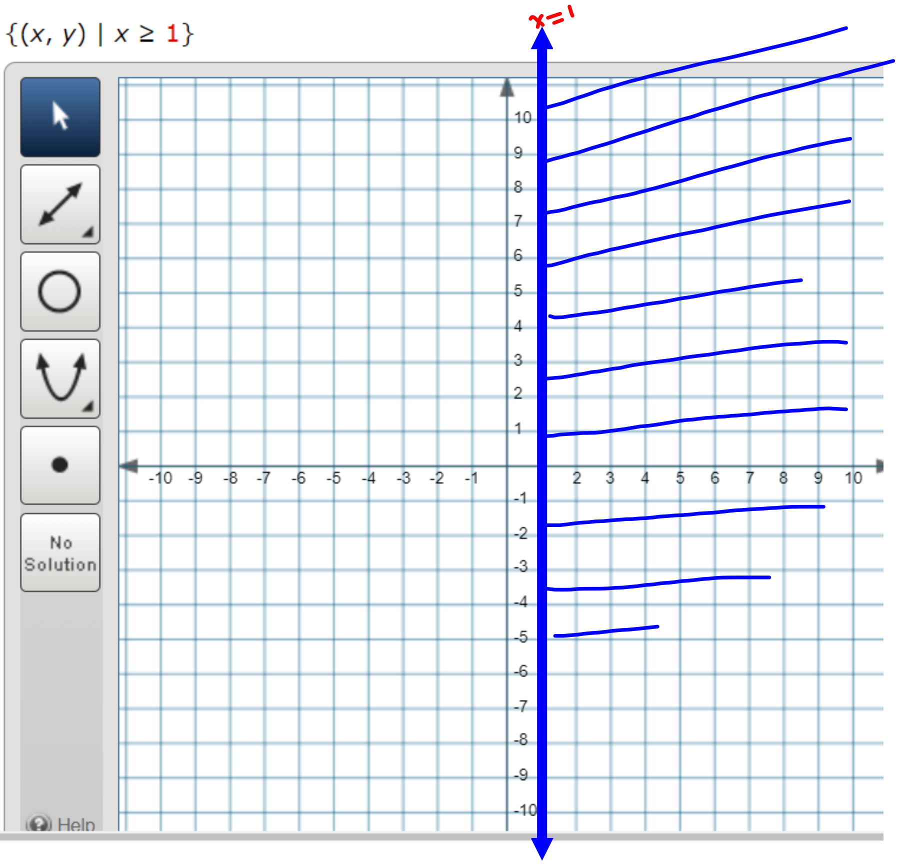
(−1, 0), (3, 0), (2.8, −1.3), (−4.5, 5.5)



9

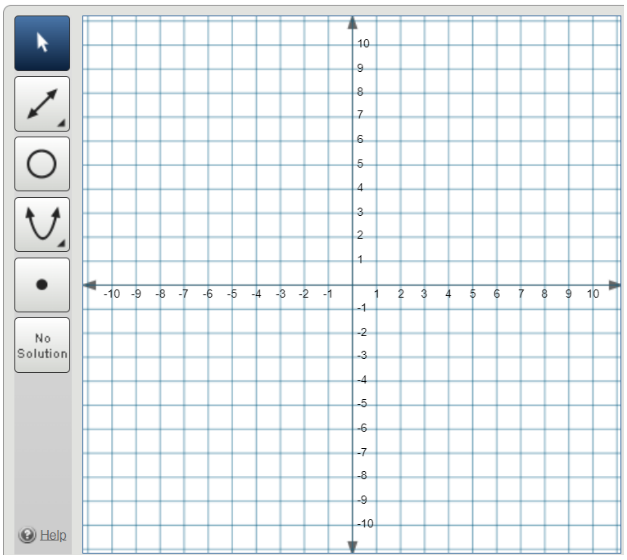
Sketch the region given by the set.

(a) $\{(x, y) \mid x \geq 1\}$



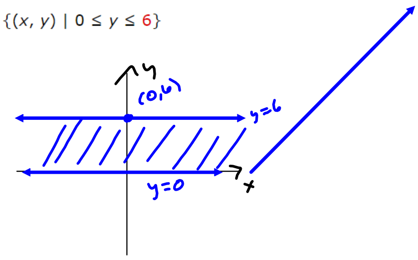
9 Cnt'd

(b) $\{(x, y) \mid y = 1\}$



10 Sketch the region given by the set.

(a) $\{(x, y) \mid 0 \le y \le 6\}$



(b) $\{ (x,y) \mid \ |y| < 6 \}$

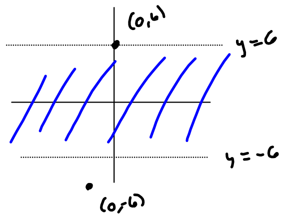
$|y| = \begin{cases} y & \text{if } y \ge 0 \\ -y & \text{if } y < 0 \end{cases}$

$|y| < 6$ means

$y < 6$ and $y > -6$

we're closer to $y=0$ than to $y=6$

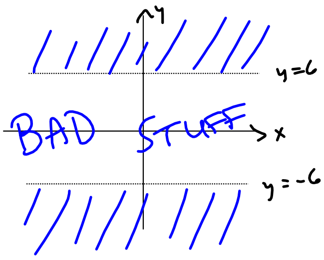
Great job on $|y| < 6$



$\{ (x,y) \mid |y| > 6 \}$ More than 6 units away from x-axis.

$|y| > 6$ means

$y > 6$ OR $y < -6$



11 Sketch the region given by the set.

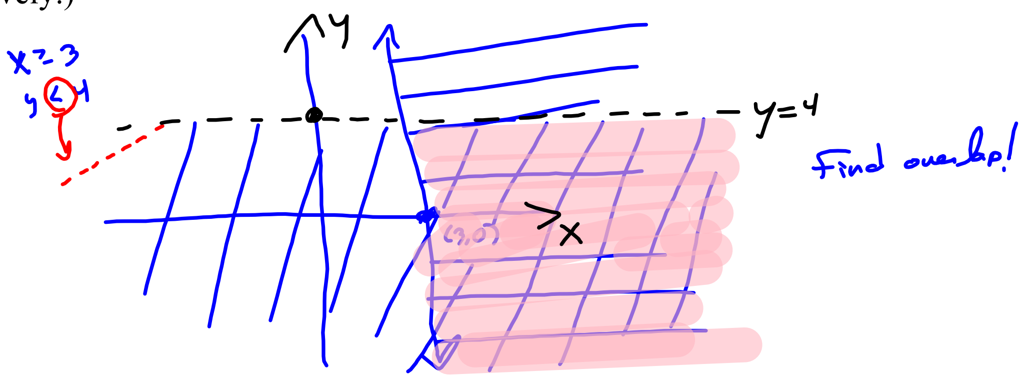
$\{(x, y) \mid x \geq 3 \text{ and } y < 4\}$

Finding a Feasible Region

(Used in Linear Programming, extensively.)

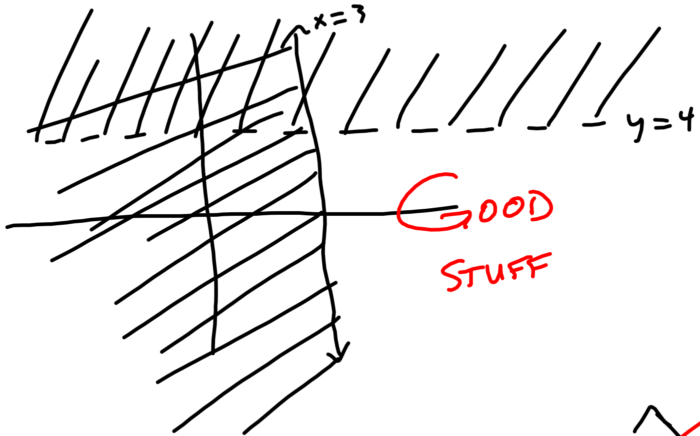
I show 2 ways of shading a system of inequalities.

The 2nd way is the OPPOSITE of how it's taught, with the advantage that the CLEAN part of your graph is the "Good Stuff."



x ≥ 3
y < 4

SCRATCH OUT THE BAD Stuff!



Pollution $3x+2y \leq 18 \rightarrow$

x	y
0	9
6	0

Public Relations $5x-3y \leq 15 \rightarrow$

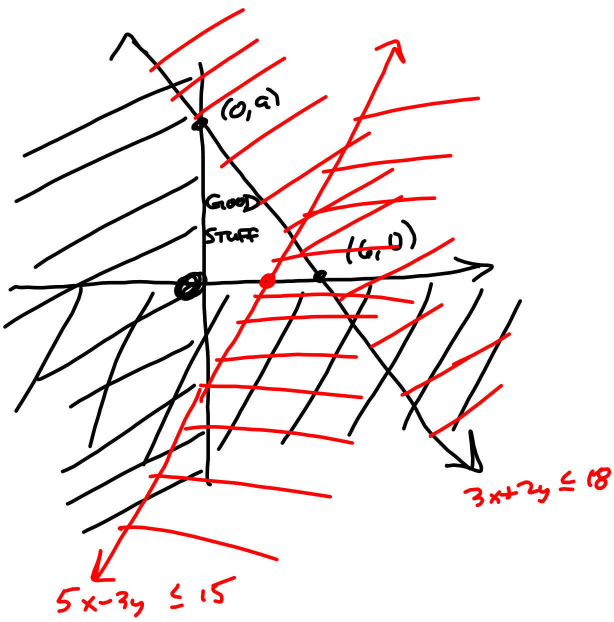
x	y
0	-5
3	0

$x \geq 0$

$y \geq 0$

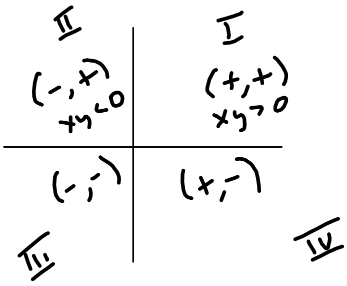
$0 \leq 18$? (0,0) Good

$0 \leq 15$? Yes (0,0) Good



13 Sketch the region given by the set.

$$\{(x, y) \mid xy < 0\}$$



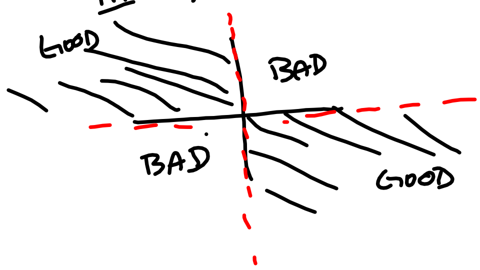
~~$xy<0$ from $(+)(-) = -$~~ <0

II $xy<0$ from $(-)(+) = -$ <0

I $xy>0$ from $(+)(+) = +$ >0

IV $xy<0$ from $(+)(-) = -$ <0

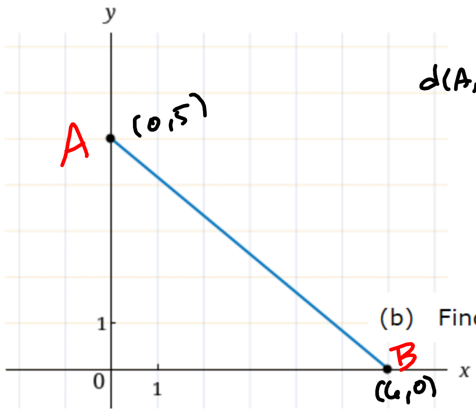
III $xy>0$ ∴ $(-)(-)$



DOTTED LINE FOR "<".

(SOLID LINE FOR "≤")

15 A pair of points is graphed.



(a) Find the distance between them.

$A=(x_1,y_1)=(0,5)$, $B=(6,0)$ →

$d(A,B)=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$=\sqrt{(6-0)^2+(0-5)^2}$ → $(-5)^2=5^2$

$=\sqrt{6^2+5^2}$

$=\sqrt{36+25} = \sqrt{61}$

(b) Find the midpoint of the segment that joins them.

midpoint of $\overline{AB}$

$=\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)=\left(\frac{0+6}{2},\frac{5+0}{2}\right)$

$=\left(\frac{6}{2},\frac{5}{2}\right)=\left(3,\frac{5}{2}\right)$

$\frac{5}{2}=2\frac{1}{2}$ but mixed fractions suck. $2\frac{1}{2}$ looks like $(2)(\frac{1}{2})=1$!

2.5 or $\frac{5}{2}$

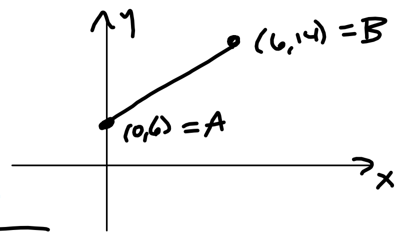
17 A pair of points is given.

(0, 6), (6, 14)

(a) Plot the points in a coordinate plane.

(b) Find the distance between them.

(c) Find the midpoint of the segment that joins them.



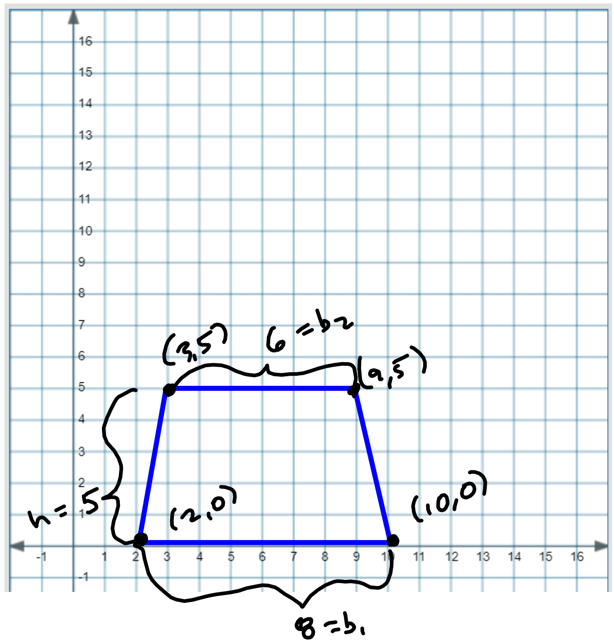
(a) $d(A,B)=\sqrt{(6-0)^2+(14-6)^2} = \sqrt{6^2+8^2}$

$= \sqrt{36+64} = \sqrt{100} = 10$

(b) midpoint : $\left(\frac{6+0}{2},\frac{14+6}{2}\right)=\left(\frac{6}{2},\frac{20}{2}\right)=(3,10)$

19 In this exercise we find the area of a plane figure.

Plot the points $A(2, 0)$, $B(10, 0)$, $C(9, 5)$, and $D(3, 5)$ on a coordinate plane. Draw the segments AB, BC, CD, and DA.



What kind of quadrilateral is $ABCD$? TRAPEZOID

b_x = Base length
h = height

What's its area?

$A = \frac{1}{2}(b_1 + b_2)h$

$= \frac{1}{2}(8+6)(5) = \frac{1}{2}(14)(5) = 7(5) = 35$

20

In this exercise we use the Distance Formula.

Which of the points $C(-6, -1)$ or $D(3, 0)$ is closer to the point $E(-2, 1)$?

- ○ Point C is closer to point E. Yes
- ○ Point D is closer to point E. No
- ○ Points C and D are the same distance from point E. No

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31

$d(C,E) = \sqrt{(-2-(-6))^2 + (1-(-1))^2}$

$= \sqrt{4^2 + 2^2} = \sqrt{16+4} = \sqrt{20}$

$= 2\sqrt{5}$

$2 \,|\, 20$, $2 \,|\, 10$, 5

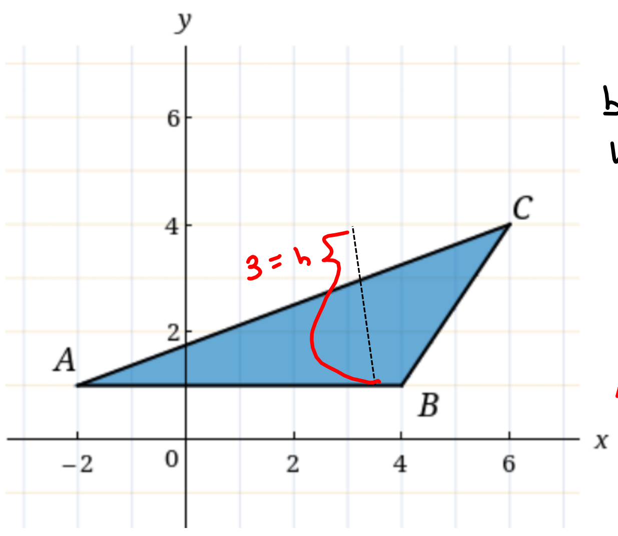
$\sqrt{20} = 2\sqrt{5}$

$2 \,|\, 26$, 13

$d(D,E) = \sqrt{(-2-3)^2 + (1-0)^2} = \sqrt{5^2 + 1^2} = \sqrt{26}$

21

Find the area of the triangle shown in the figure.



Area of triangle is

$\frac{1}{2}bh$, where

b = base length

h = height

$A = (-2, 1)$

$B = (4, 1)$

$C = (6, 4)$

SAME HEIGHT!

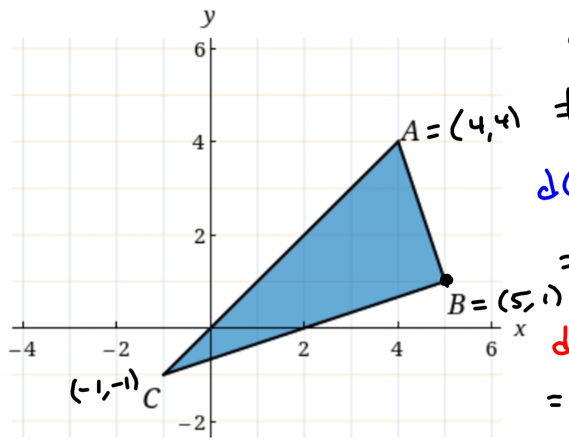
$4-(-2)$

$d(A,B) = 6$. BASE b

height $= 4 - 1 = 3$!

$A = \frac{1}{2}bh = \frac{1}{2}(6)(3) = 3(3) = 9$

22 Refer to triangle *ABC* in the figure below.



$d(A,B) = \sqrt{(4-5)^2 + (4-1)^2}$

$= \sqrt{(-1)^2 + (3)^2} = \sqrt{1+9} = \sqrt{10}$

$d(A,C) = \sqrt{(4-(-1))^2 + (4+1)^2}$ $\quad 2\,|\,50,\ 5\,|\,25,\ 5$

$= \sqrt{5^2 + 5^2} = \sqrt{2(5)^2} = 5\sqrt{2} = \sqrt{50}$

$2\,|\,40,\ 2\,|\,20,\ 2\,|\,10,\ 5$

$d(B,C) = \sqrt{(5+1)^2 + (1+1)^2}$

$= \sqrt{6^2 + 2^2} = \sqrt{36+4} = \sqrt{40} = 2\sqrt{10}$

(a) Show that the triangle *ABC* is a right triangle by using the converse of the Pythagorean Theorem.

We must first find the length of all three sides of the triangle by finding the distance between the vertices.

Check for Pythagorus

$(\sqrt{10})^2 + (\sqrt{40})^2 = 10 + 40 = 50$

$= (\sqrt{50})^2$

Therefore, the following conclusion can be reached.

- ○ Since $[d(A, B)]^2 + [d(A, C)]^2 = [d(B, C)]^2$, triangle *ABC* is a right triangle.
- ○ Since $[d(A, B)]^2 + [d(B, C)]^2 = [d(A, C)]^2$, triangle *ABC* is a right triangle.
- ○ Since $[d(A, C)]^2 + [d(B, C)]^2 = [d(A, B)]^2$, triangle *ABC* is a right triangle.
- ○ Since all sides have the same length, triangle *ABC* is a right triangle.
- ○ Since all sides have different lengths, triangle *ABC* is a right triangle.

(b) Find the area of triangle *ABC*.

$A = \frac{1}{2}bh = \frac{1}{2}(d(B,C))(d(A,B))$

$\sqrt{40}$ or $2\sqrt{10}$

$\cancel{= \frac{1}{2}\sqrt{50}\sqrt{10}}$

$\cancel{= \frac{1}{2}(5\sqrt{2})\sqrt{10}}$

$\cancel{= \frac{1}{2}(5)(\sqrt{20})}$

$\cancel{= \frac{1}{2}(5)(2)\sqrt{5}}$

$\cancel{= 5\sqrt{5}}$

$A = \frac{1}{2}(2\sqrt{10})(\sqrt{10})$

$= \frac{1}{2}(2)(\sqrt{10}\sqrt{10})$

$= 1(\sqrt{10^2}) = 1(10) = 10$

23 In this exercise we use the Distance Formula.

Show that the points $A(-3, 1)$, $B(1, 9)$, and $C(3, 13)$ are collinear by showing that $d(A, B) + d(B, C) = d(A, C)$.

We must first find $d(A, B) + d(B, C)$ and $d(A, C)$.

$d(A, B)$ = [ ]

$d(B, C)$ = [ ]

$d(A, C)$ = [ ]

Thus, we see that $d(A, B) + d(B, C)$ [---Select---] $d(A, C)$, so the points [---Select---] collinear.

24 In this exercise we use the Distance Formula.

Find a point on the y-axis that is equidistant from the points $(8, -8)$ and $(3, 3)$.

$A = \boxed{(0, y)}$ $B = (8, -8)$, $C = (3, 3)$

$d(A, B) = d(A, C) = \sqrt{(8-0)^2 + (-8-y)^2} =$

$= d(A, C) = \sqrt{(3-0)^2 + (3-y)^2}$

$(a+b)^2 = a^2 + 2ab + b^2$

$(a-b)^2 = a^2 - 2ab + b^2$

$\Rightarrow \sqrt{8^2 + (-8-y)^2} = \sqrt{3^2 + (3-y)^2}$

$(-8-y)^2 \to ((-1)(8+y))^2$ $\quad (3-y)^2 \to (y-3)^2$

$= (-1)^2 (8+y)^2$

$= (8+y)^2 = (y+8)^2$

$\Rightarrow \sqrt{64 + y^2 + 2(8)y + 8^2} = \sqrt{9 + y^2 - 2(3)y + 3^2}$

$\sqrt{A} = \sqrt{B}$

$\Rightarrow A = B$

$y^2 + 16y + 128 = y^2 - 6y + 18$

$-y^2 \qquad -y^2$

$16y + 128 = -6y + 18$

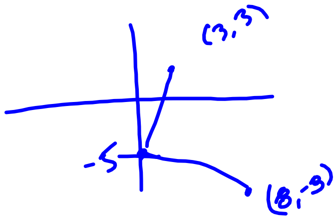
$+6y \qquad = +6y$

$22y + 128 = 18$

$-128 = -128$

$22y = -110$

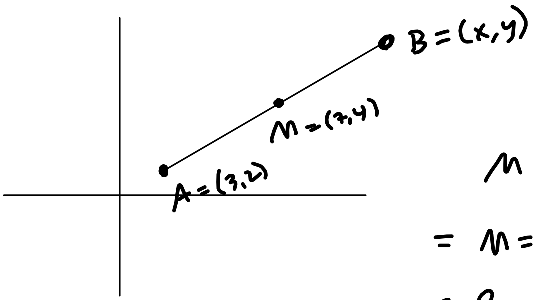
$y = \frac{-110}{22} = -\frac{10}{2} = \boxed{-5 = y}$ & on y-axis



$\Rightarrow \boxed{(0, -5)}$!

25 In this exercise we use the Distance Formula and the Midpoint Formula.

If $M(7, 4)$ is the midpoint of the line segment AB and if A has coordinates $(3, 2)$, find the coordinates of B.



x = x-coord of B
y = y-coord " A

M is the midpoint of $\overline{AB}$.

$= M = \left(\frac{3+x}{2}, \frac{2+y}{2}\right) = (7,4)$

Solve for x & y:

$(2)\left(\frac{3+x}{2} = 7\right)$ & $\left(\frac{2+y}{2} = 4\right)(2)$

$x+3=14$
$-3=-3$
$x=11$

$2+y=8$
$-2=-2$
$y=6$

$B = (11,6)$

26 Suppose that each point in the coordinate plane is shifted 4 units to the right and 5 units upward.

(a) The point (2, 9) is shifted to what new point?

$(2+4, 9+5) = (6, 14)$

(b) The point (a, b) is shifted to what new point?

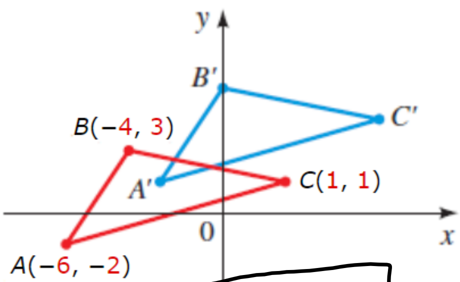
$(a+4, b+5) =$

(c) What point is shifted to (4, 7)? $= (x+4, y+5)$

$\Rightarrow x+4 = 4 \Rightarrow \boxed{x=0}$, $y+5=7 \Rightarrow \boxed{y=2}$

$\boxed{(0,2) = (c)}$

(d) Triangle ABC in the figure has been shifted to triangle $A'B'C'$.



$A' = (-6+4, -2+5) = \boxed{(-2,3) = A'}$

Find the coordinates of the points A', B', and C'.

$B' = (-4+4, 3+5) = \boxed{(0,8) = B'}$

$C' = (1+4, 1+5) = \boxed{(5,6) = C'}$

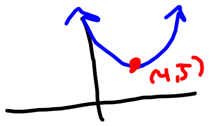
$(x,y) \longmapsto (x+4, y+5)$

If this were a function $f(x)$ to be shifted right 4 & up 5, the new function would be

$g(x) = f(x-4)+5$

$f(x) = x^2$

$f(x-4)+5 = (x-4)^2+5$



!

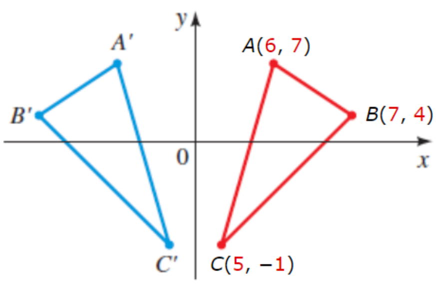
F2 Pre-view
WP#2 Preview

Suppose that the y-axis acts as a mirror that reflects each point to the right of it into a point to the left of it.

(a) The point (5, 5) is reflected to what point?

27 (b) The point (a, b) is reflected to what point?

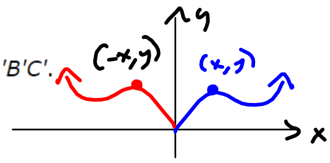
(d) Triangle ABC in the figure is reflected to triangle $A'B'C'$.



Find the coordinates of the points A', B', and C'.

Reflection about y-axis

$x \longmapsto -x$



(a) $(-5,5)$

(b) $(-a,b)$

(c) $A' = (-6,7)$

$B' = (-7,4)$

$C' = (-5,-1)$