

Circles standard & expanded form

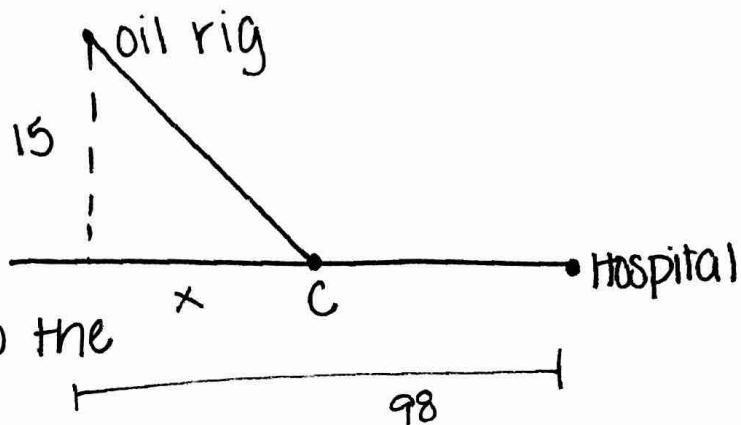
AZ

Warm up

1. The distance between $(-2, 5)$ & $(4, y)$ is 8 units, find the possible y values.

2. An injured worker must be rushed from an oil rig to the nearest hospital.

a) how far does the worker travel in terms of x , if a boat takes him to point C & an ambulance to the hospital?

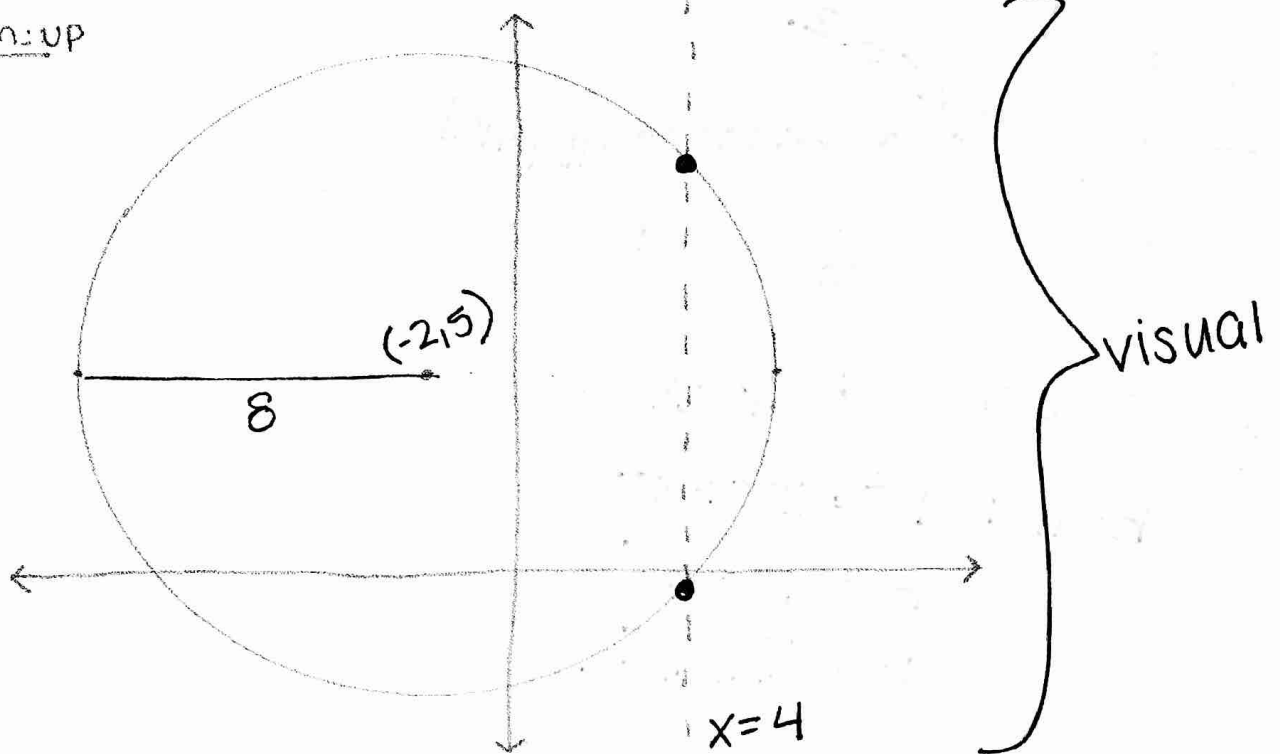


b) The boat travels 23mph & ~~an~~ ambulance at 70mph, how long will it take in terms of x ?

c) what ~~amount of time~~ distance of x on the boat minimizes his travel time?

Warm: up

1)



$$8^2 = (x+2)^2 + (y-5)^2$$

$$8^2 = (4+2)^2 + (y-5)^2$$

$$64 = 36 + (y-5)^2$$

$$28 = y^2 - 10y + 25$$

$$0 = y^2 - 10y - 3$$

$$\frac{10 \pm \sqrt{100 - 4(1)(-3)}}{2}$$

$$\frac{10 \pm \sqrt{112}}{2}$$

$$\star 8 = \sqrt{(4+2)^2 + (y-5)^2}$$

$$64 = 36 + (y-5)^2$$

$$28 = (y-5)^2$$

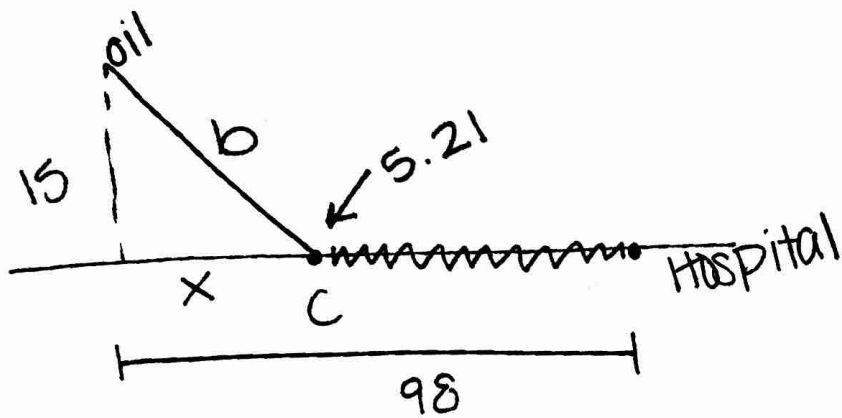
$$\pm \sqrt{28} = y - 5 \quad \text{decimal} \quad \star$$

$$5 \pm \sqrt{28} = y \quad \rightarrow \quad 5 \pm 2\sqrt{7}$$

$$5 \pm \sqrt{28}$$

$$5 \pm 5.29$$

$$\boxed{10.29 \text{ or } -0.29}$$



a) ambulance : $98 - x$.

boat : $b^2 = 15^2 + x^2$

$$b = \sqrt{15^2 + x^2}$$

$$b = \sqrt{225 + x^2} .$$

b) boat 23mph, ambulance 70mph

$$98 - x \text{ miles} \left(\frac{1 \text{ hr}}{70 \text{ miles}} \right) = \frac{98 - x}{70} \text{ hrs}$$

$$\sqrt{225 + x^2} \text{ miles} \left(\frac{1 \text{ hr}}{23 \text{ miles}} \right) = \frac{\sqrt{225 + x^2}}{23} \text{ hrs}$$

c) Total Time = $\underbrace{\frac{98 - x}{70}}_{\text{amb.}} + \underbrace{\frac{\sqrt{225 + x^2}}{23}}_{\text{boat}}$

notes

remember from yesterday the circle equation:

complete the square
FOIL

$$r^2 = (x-h)^2 + (y-k)^2$$

$r \rightarrow$ radius
 $(h,k) \rightarrow$ center

$$0 = x^2 + y^2 + ax + by + c$$

this is the standard form

this is the expanded form

ex1 write in expanded form : $9 = (x-2)^2 + (y+1)^2$

$$\rightarrow 9 = (x-2)(x-2) + (y+1)(y+1)$$

$$9 = x^2 - 4x + 4 + y^2 + 2y + 1$$

$$9 = x^2 + y^2 - 4x + 2y + 5$$

$$0 = x^2 + y^2 - 4x + 2y - 4$$

* equal to zero

* ordered by degree

ex2 write in standard form :

$$1) x^2 + 8x + y^2 - 6y = -21$$

$$(x^2 + 8x + 16) + (y^2 - 6y + 9) = -21 + 16 + 9$$

$$(x+4)^2 + (y-3)^2 = 4$$

complete the square for
 x & y

even the eq.

$$2) x^2 - 12x + y^2 + 10y = 20$$

$$3) x^2 - 2x = -y^2 + 18y = -18$$

ex3 when you have to use multiple steps:

1) write in standard form: center $(4, -7)$; $A = 81\pi$

$$\left. \begin{array}{l} A = \pi r^2 \\ 81\pi = \pi r^2 \\ 9 = r \end{array} \right\} \begin{array}{l} \text{use to} \\ \text{get} \\ r \end{array}$$

$$\begin{aligned} 9^2 &= (x-4)^2 + (y+7)^2 \\ \boxed{81} &= (x-4)^2 + (y+7)^2 \end{aligned}$$

2) write in expanded form: center $(0, 5)$; $C = 2\pi\sqrt{7}$

$$C = 2\pi r$$

$$2\pi\sqrt{7} = 2\pi r$$

$$\sqrt{7} = r$$

$$(\sqrt{7})^2 = x^2 + (y-5)^2$$

$$7 = x^2 + y^2 - 10y + 25$$

$$\boxed{0 = x^2 + y^2 - 10y + 18}$$