

Name: KEY

Date: _____

On February 11, 2008, Singapore opened a new observation wheel called the Singapore Flyer. At the time of its opening, this giant Ferris wheel was the tallest in the world. The Singapore Flyer consists of an observation wheel with a diameter of 150 meters atop a boarding terminal, giving the structure an overall height of 165 meters. Twenty-eight airconditioned capsules rotate on the outside of the wheel to provide unobstructed views of the city. The wheel rotates at a constant rate of 26 centimeters per second. This is slow enough that the wheel does not need to stop for loading and unloading unless there are special passenger needs. $165 - 150 = 15$

1. Draw an accurate diagram of the Ferris Wheel.

2. What is the circumference of the wheel in cm?

$$C = \pi d \quad 150 \text{ m} = 150,000 \text{ cm}$$

$$C = 150,000 \pi \text{ cm} = \boxed{471,000 \text{ cm}}$$

3. How long (in seconds) does it take a capsule to travel all the way around the wheel?

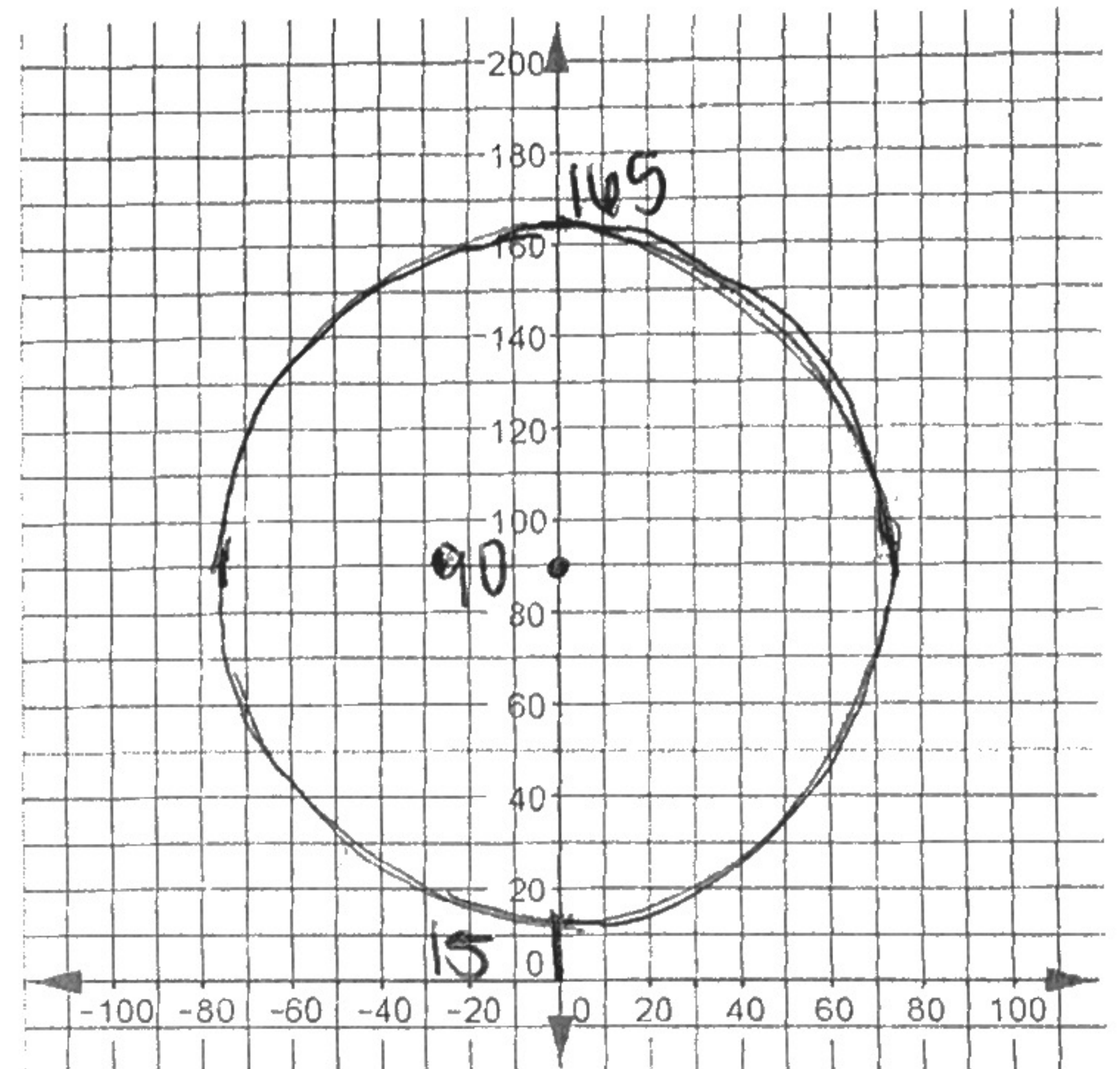
$$471,000 \text{ cm} \left(\frac{1 \text{ sec}}{26 \text{ cm}} \right) = \boxed{18,115 \text{ sec}}$$

How many minutes is this?

$$\frac{18,115 \text{ sec}}{60 \text{ sec}} = \boxed{301.9 \text{ min}}$$

4. How many degrees does the capsule travel in one minute?

$$\text{circle} \rightarrow \frac{360^\circ}{301.9 \text{ min}} = 1.192 \text{ degree/min} \Rightarrow \boxed{1.2 \text{ degree/min}}$$



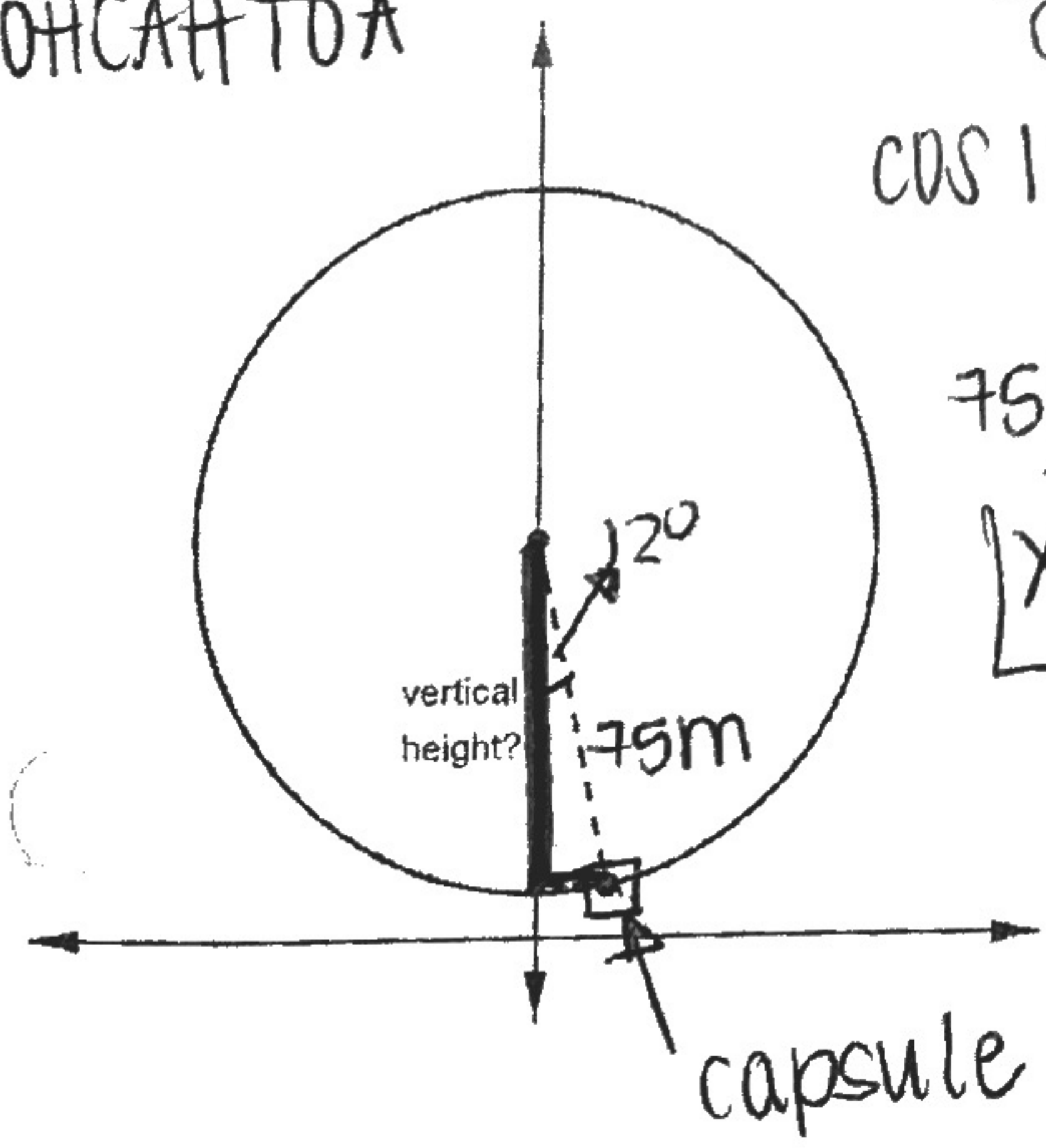
need ~~x~~ 5. What is the vertical height of the capsule after one minute?

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leg of the Δ created by
 $\cos 12 = \frac{x}{75}$

$$75 \cos 12 = x$$

$$\boxed{x = 73.36 \text{ m}}$$

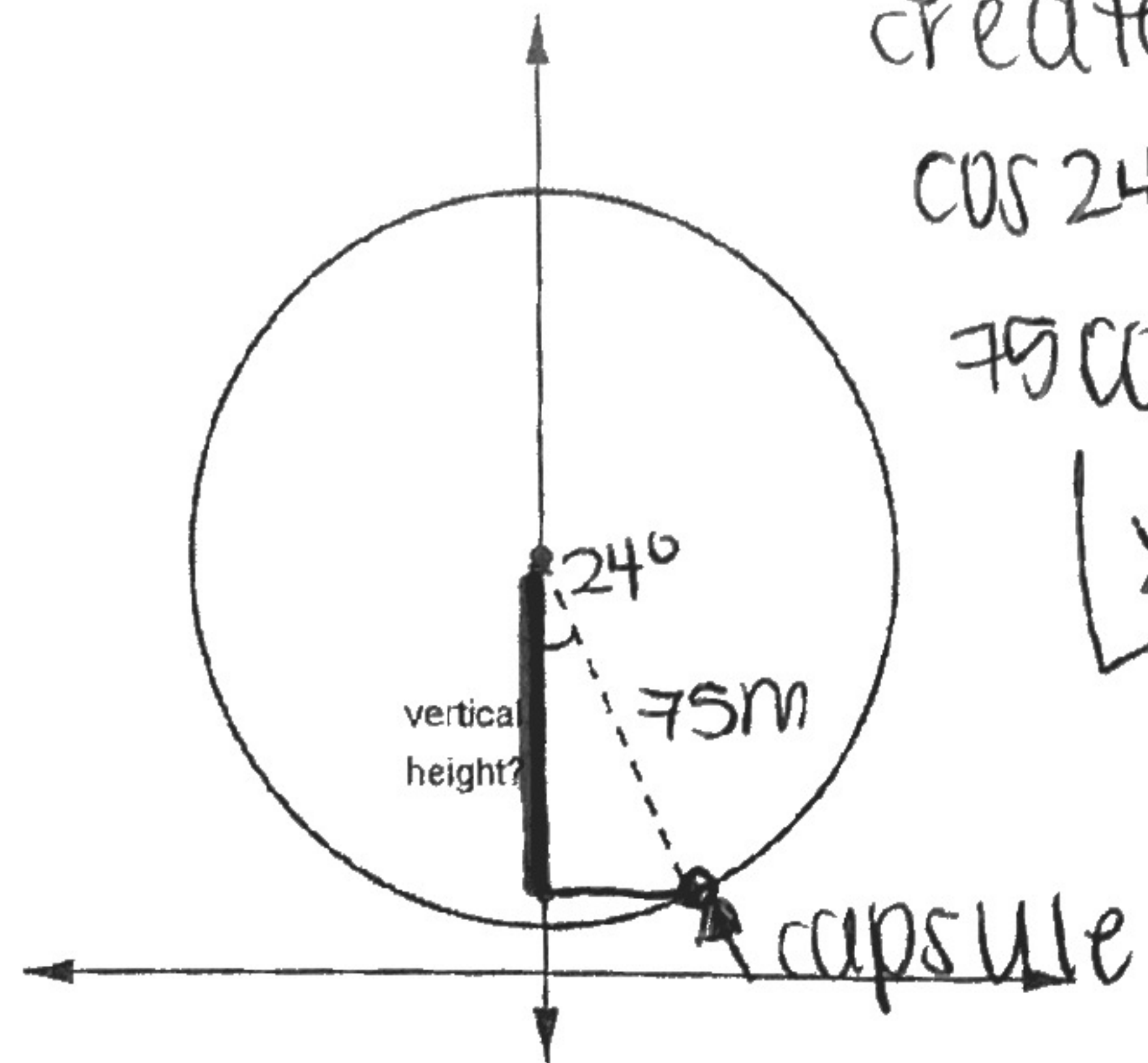


6. What is the vertical height of the capsule after two minutes?

leg of the Δ created by
 $\cos 24 = \frac{x}{75}$

$$75 \cos 24 = x$$

$$\boxed{x = 68.92 \text{ m}}$$



7. Fill out the table for the height of the capsule.

Time (min)	Angle of Rotation from Boarding Station	Sketch of Ferris Wheel (use attached)	Vertical Leg of Triangle (m)	Height of Capsule (m) (from ground)
1	12°	↑	73.36	$90 - 73.36 = 16.6$
2	24°	↑	68.52	$90 - 68.52 = 21.48$
5	60°	↑	37.5	$90 - 37.5 = 52.5$
7	84°	↑	7.84	$90 - 7.84 = 82.16$
10	120°	↑	37.5	$90 + 37.5 = 127.5$ m
15	180°	↑	75	165m top of wheel
17	204°	↑	68.5	158.5
20	240°	↑	37.5	127.5
22	264°	↑	7.84	97.84
26	312°	↑	50.18	$90 - 50.18 = 39.82$
28	336°	↑	68.5	$90 - 68.5 = 21.5$
30	360°	↓	75m	15m bottom of wheel

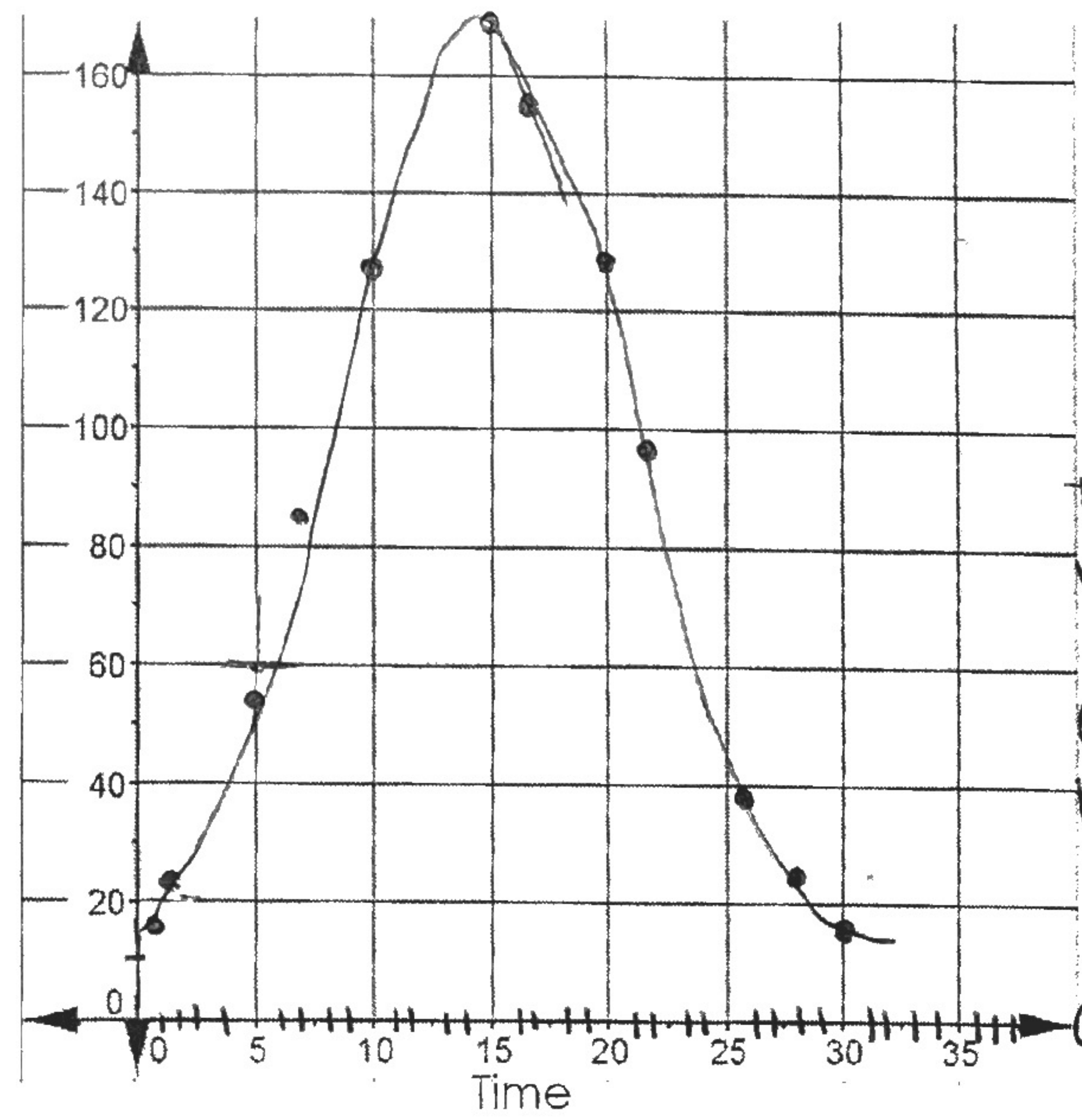
on front #5-6

attached
work
see

8. Use the table to graph the height of a capsule as it makes one full revolution around the Ferris Wheel.

- (1, 16.6)
- (2, 21.48)
- (5, 52.5)
- (7, 82.16)
- (10, 127.5)
- (15, 165)
- ⋮
- etc.

height (m)



I can connect the points because the Ferris wheel has a continuous motion & does not stop at discrete points.

VL = vertical leg

5 min = 60°

vertical leg:

$$\cos 60 = \frac{x}{75}$$

$$x = 75 \cos 60$$

$$x = 37.5$$

7 min

vertical leg:

$$\cos 84 = \frac{x}{75}$$

$$x = 75 \cos 84$$

$$x = 7.84$$

10 min = 120°

height from ground = $90 + 37.5$

15 min = 180°

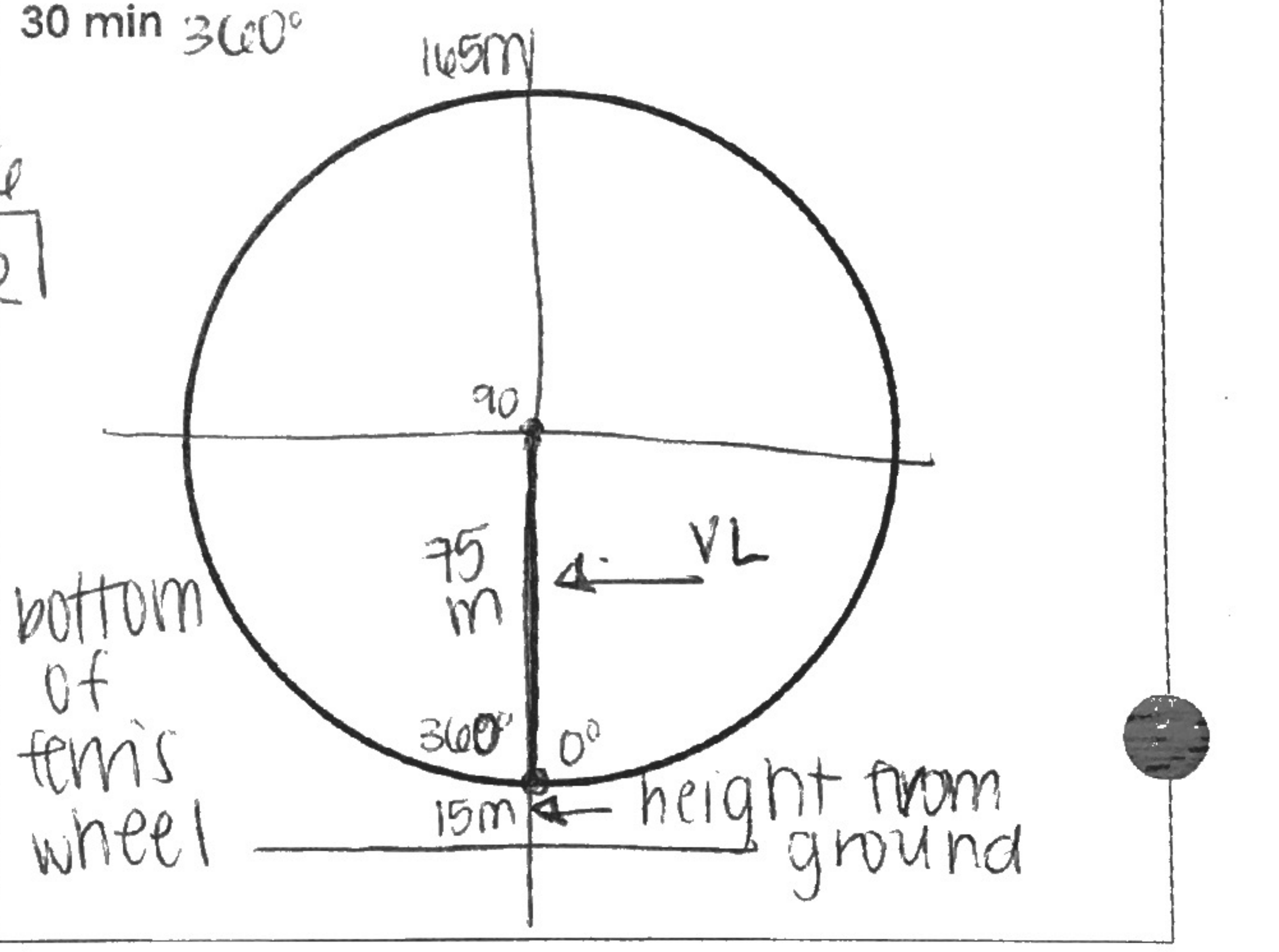
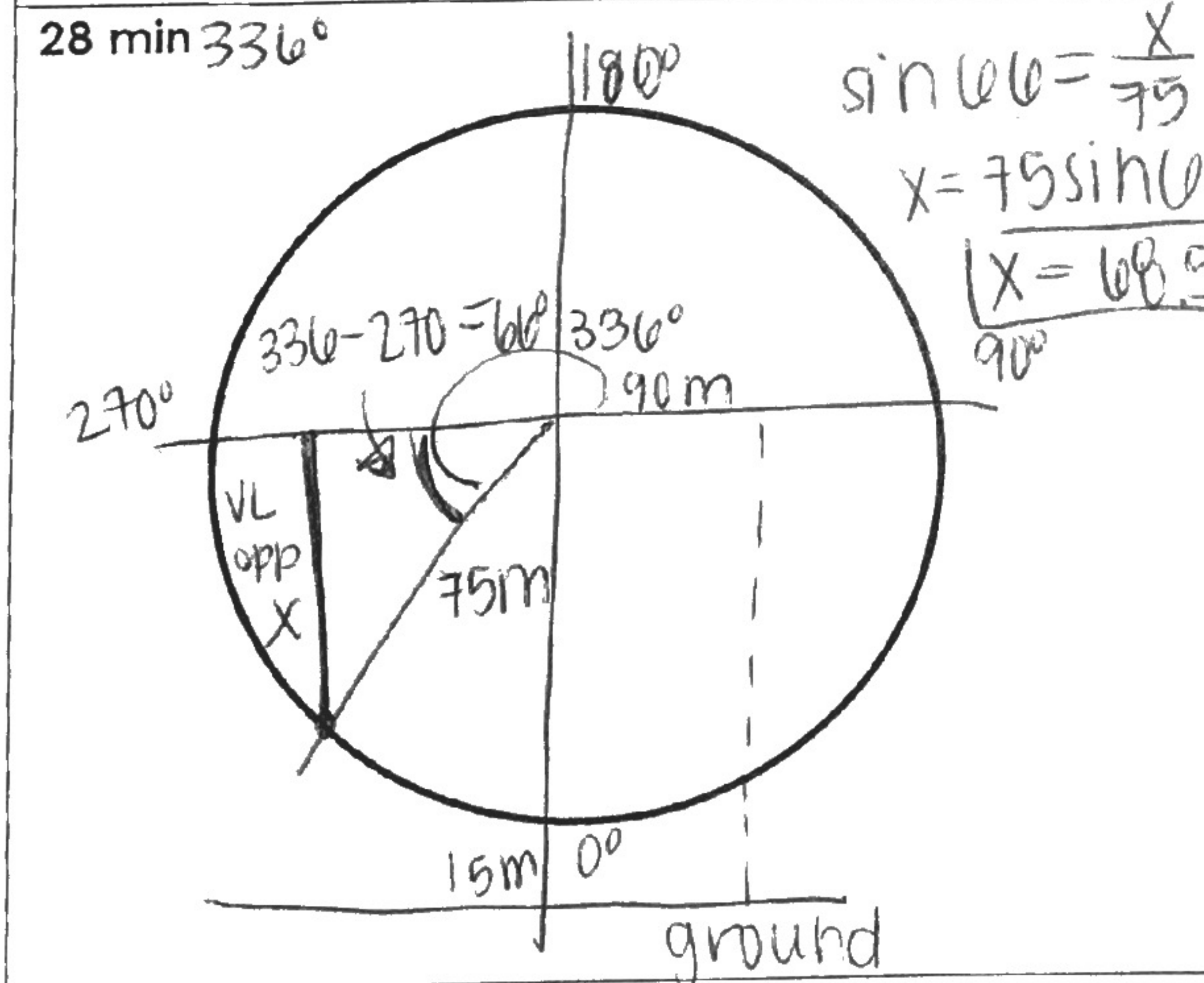
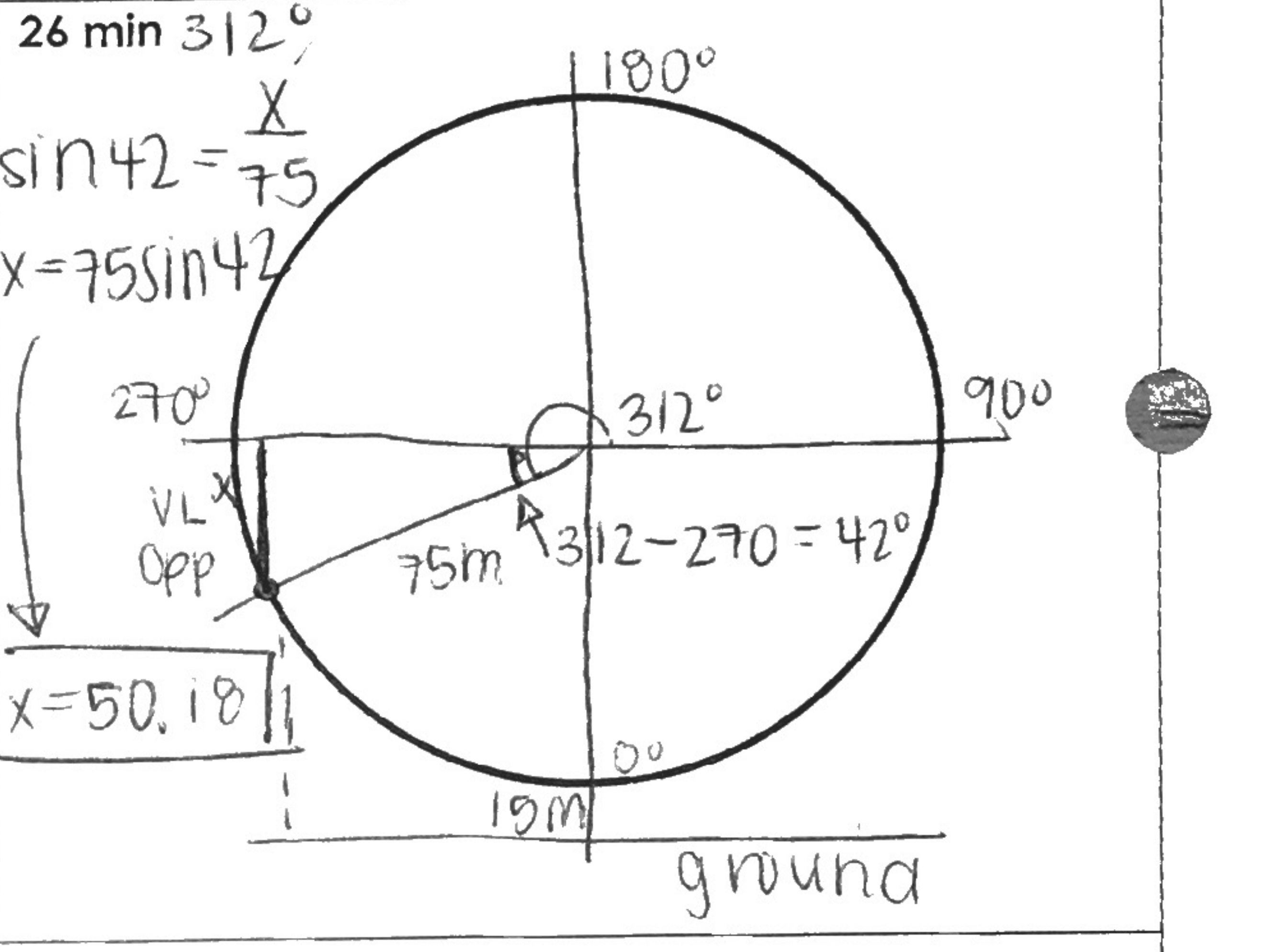
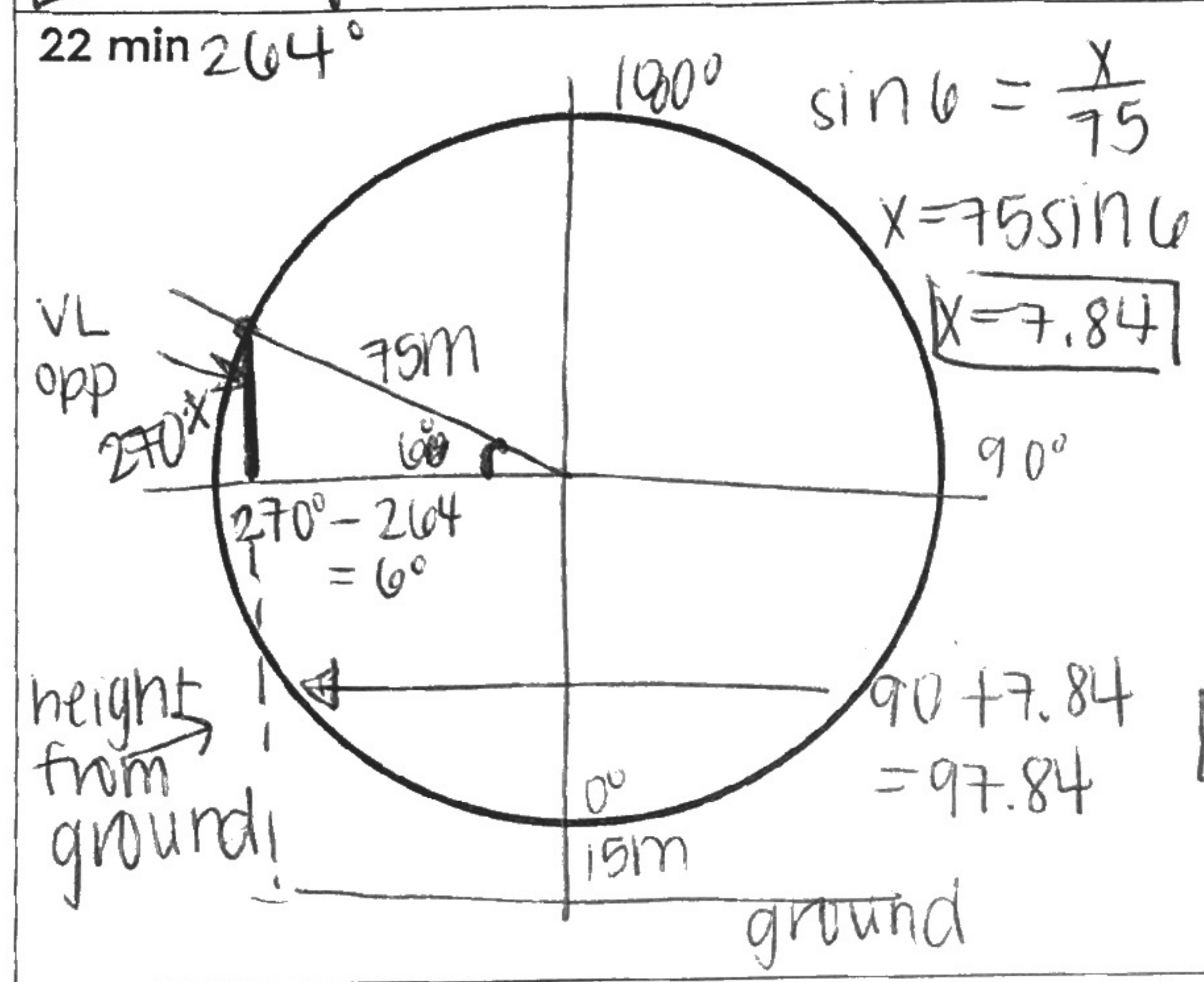
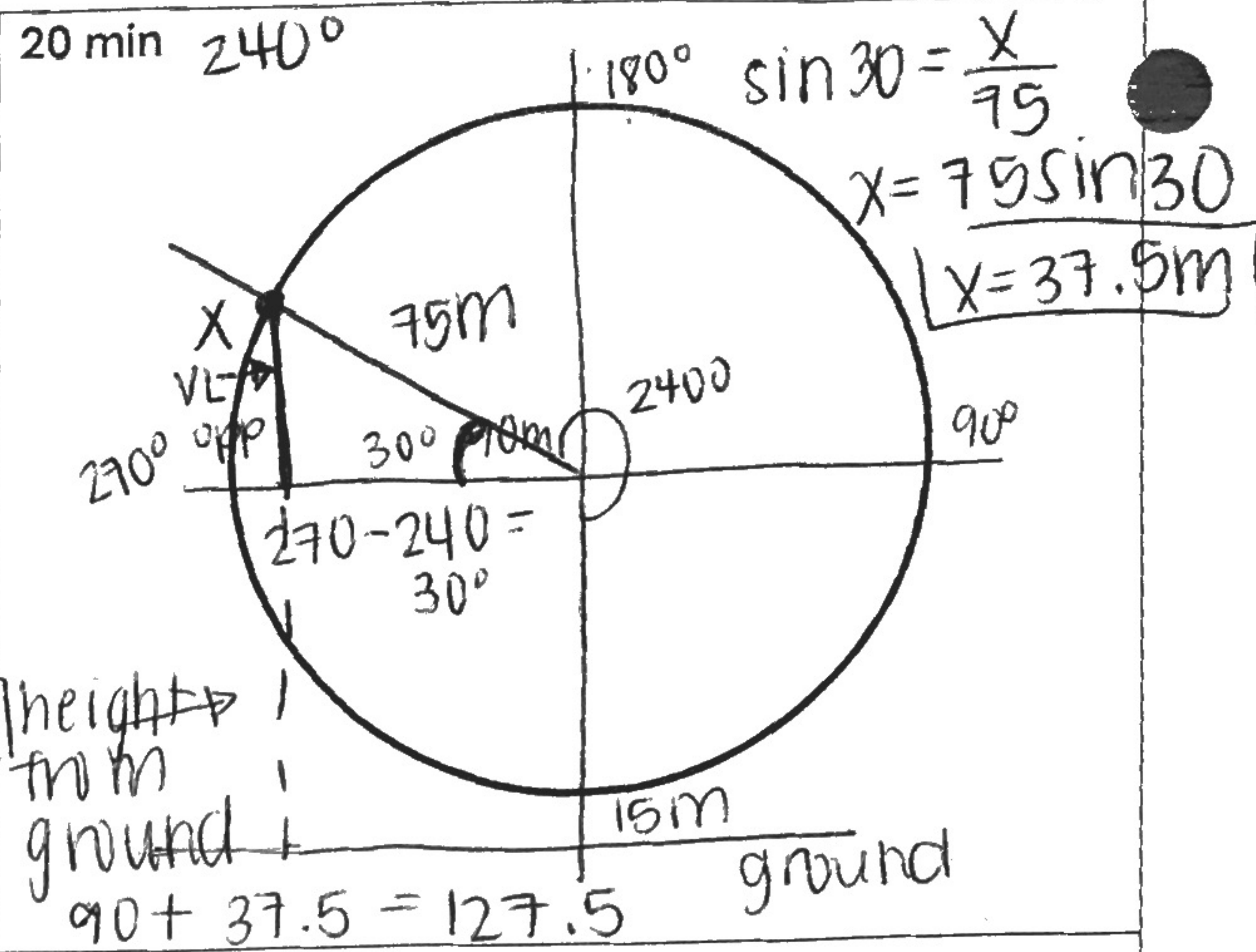
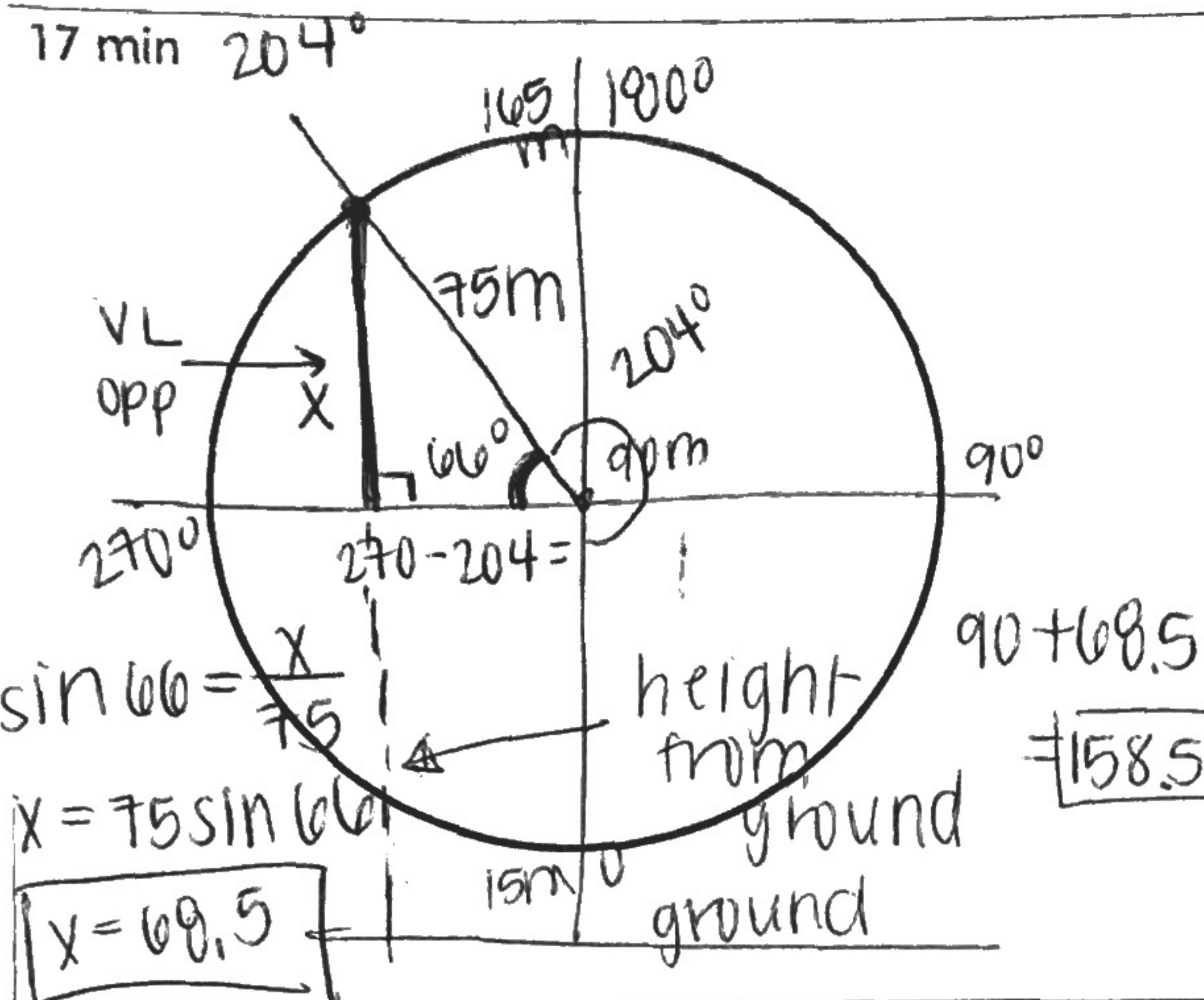
vertical leg = length of radius = $75m$

height from ground = $105m$ (top of ferris wheel)

$$\sin 30 = \frac{x}{75}$$

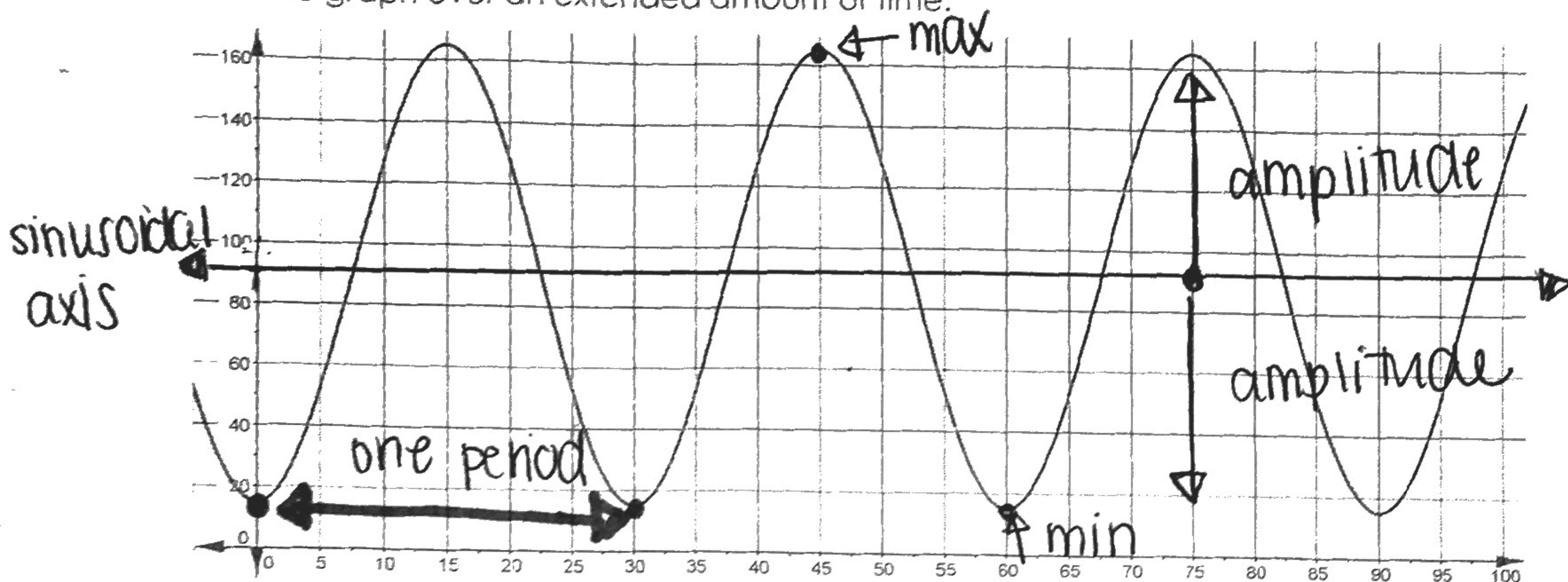
$$x = 75 \sin 30$$

$$x = 37.5m$$



The height of the Ferris Wheel is a periodic function.

Below is the graph over an extended amount of time:



9. The period is the amount of time, it take to make one complete revolution. Highlight one period. What is the period for this graph? around 30 minutes

10. What is the maximum value?

165m

What is the minimum value?

15m

The difference between the maximum and minimum value will be the diameter of the Ferris wheel.

$$165 - 15 = 150m$$

11. At what height is the center of the wheel? 90 m (half-way between 15m and 165m)

Draw a horizontal line at the height of the center of the wheel. This is called the sinusoidal axis. Label it.

12. What is the difference between the minimum height and the height of the sinusoidal axis? 90 - 15 = 75m = radius

What is the difference between the height of the sinusoidal axis and the maximum height? 165 - 90 = 75m = radius

This is the amplitude of the function.

Notice, this is the radius of the Ferris wheel.