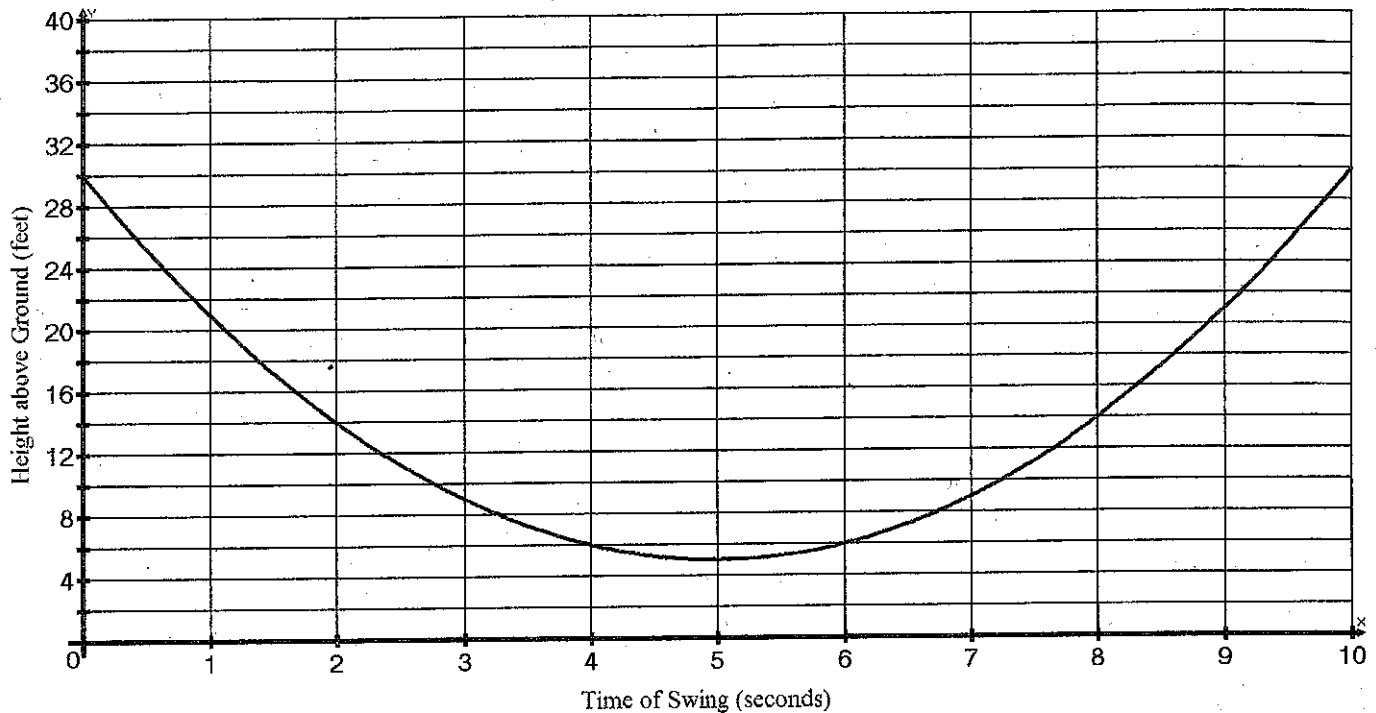


Applications of Quadratics Task

Jeremiah is having a great time on a ropes course. He has gotten to the last element which is a giant swing. As he swings down, his path is modeled by the equation $h(t) = (t - 5)^2 + 5$ where t is the time on the swing in seconds and h is his height off the ground in feet. A graph of the function is shown below:



1. At what height does Jeremiah's swing start? What point is this on the graph?

30 ft (0, 30) - the y-intercept

2. When does he reach the bottom of his swing and how high is he then? What point is this on the graph?

After 5 seconds at 5 ft (5, 5) - the vertex

3. When is Jeremiah back at the same height he started at?

At 10 seconds

4. How high is Jeremiah above the ground after 3 seconds of swinging?

9 ft. (3, 9) or $h(3) = (3-5)^2 + 5 = 9$

5. When is Jeremiah 14 feet above the ground?

At 2 and 8 seconds (2, 14) and (8, 14)

6. What is $h(8)$? What does this mean in context?

14, After 8 seconds, Jeremiah is 14 ft above the ground.

7. If $h(t) = 6$, what is t ? What does this mean in context?

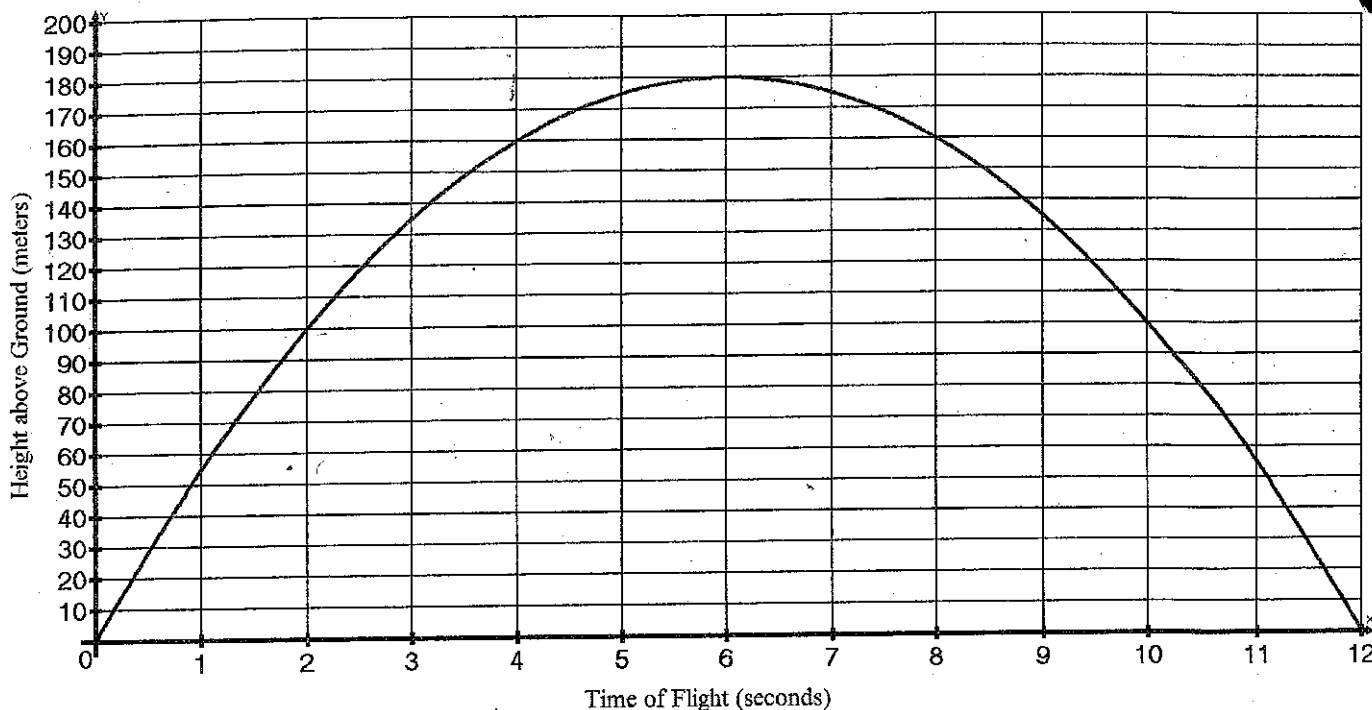
4 and 6 When Jeremiah is 6 ft above the ground, he has been swinging for

8. What is the average rate of change for $0 < x < 2$? What is the unit on this answer?

(0, 30) (2, 14) $\frac{14-30}{2-0} = -8 \text{ ft/sec}$

4 or 6 sec.

Ashante is shooting off a rocket that she made for the science fair. The path her rocket takes is modeled by the function $h(t) = -5t^2 + 60t$ where t is the time that the rocket is in the air in seconds and h is its height off the ground in meters. A graph of the function is shown below:



- At what height does Ashante's rocket start? What point is this on the graph?
0 ft (the ground) (0,0) - the y-intercept
- When does the rocket reach its peak and how high is it then? What point is this on the graph?
After 6 seconds, the rocket is at 180 ft (6,180) - vertex
- When does the rocket return to the ground? What point is this on the graph?
After 12 seconds (12,0) - the x-int or zero
- How high is the rocket above the ground after 7 seconds of flight?
175 ft $-5(7)^2 + 60(7) = 175$
- When is the rocket 100 feet above the ground?
After 2 seconds and 10 seconds
- What is $h(10)$? What does this mean in context?
 $h(10) = 100$ At 10 seconds, the rocket is 100 ft above the ground
- If $h(t) = 160$, what is t ? What does this mean in context?
 $t = 4, 8$ When the rocket is 160 ft above the ground, it has been flying for 4 or 8 seconds
- What is the average rate of change for $0 < x < 2$? What is the unit on this answer?
(0,0) (2,100) $ROC = \frac{100-0}{2-0} = 50 \text{ m/s}$
- What is the average rate of change for $2 < x < 4$? How does this rate of change compare to #8?
(2,100) (4,160) $ROC = \frac{160-100}{4-2} = \frac{60}{2} = 30 \text{ m/s}$ It is a smaller rate of increase.