MPM2D1 **Date:** _____

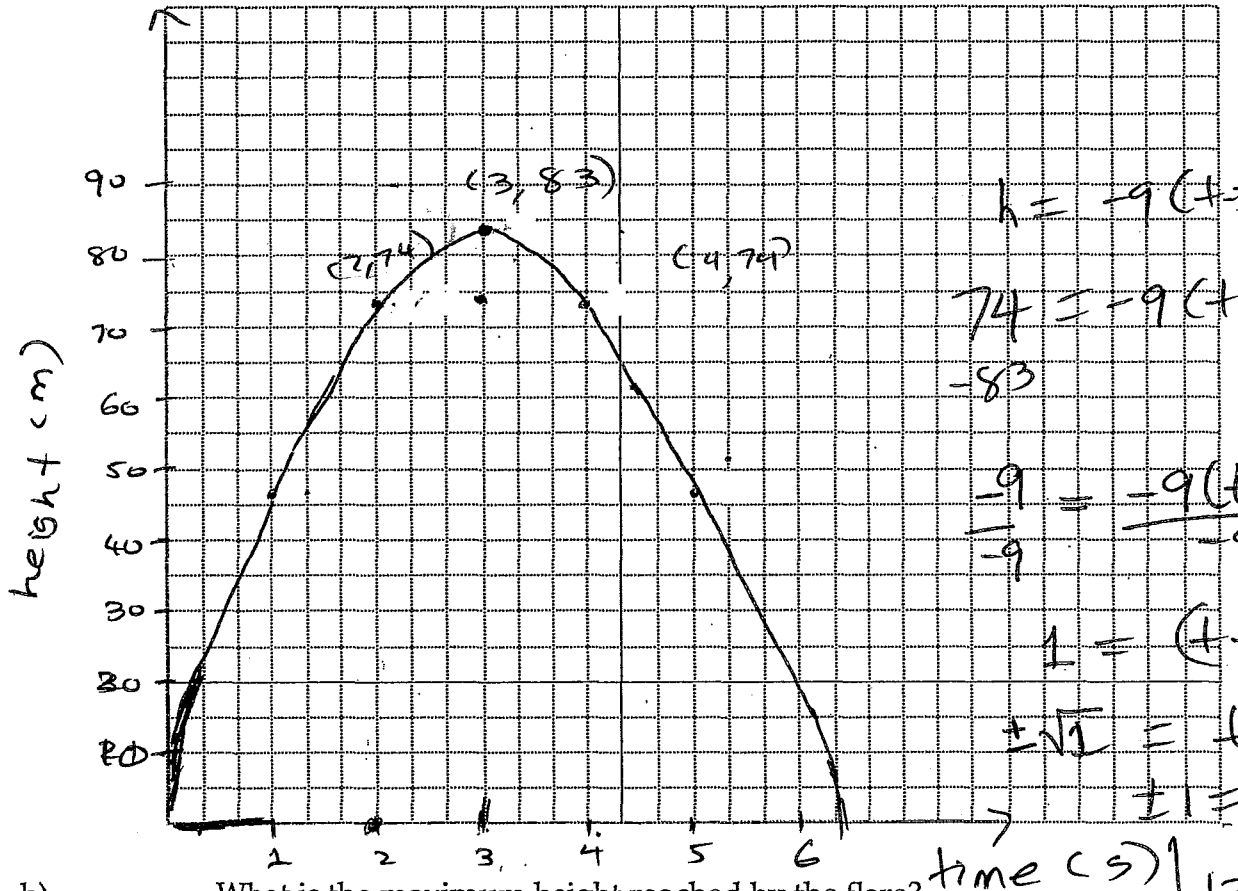
Day 8: Vertex Form Word Problems **Chapter 4: Quadratic Relations**

Vertex Form Word Problems:

1. A red flare is used by some boaters in an emergency. The flight of the flare is modelled by the function $h = -9(t-3)^2 + 83$ where h is the height (m) of the flare and t is the ~~time~~ (s) that the flare is in flight. vertex (3, 83) opening down (max)

(1,3,5,7) step pattern: −9, −27, −45

a) Sketch the path of the flare.



$h = -9(t-3)^2 + 83$

$74 = -9(t-3)^2 + 83$ -83

$-9 = -9(t-3)^2$ -9

$1 = (t-3)^2$

$\pm\sqrt{1} = t-3$

$\pm 1 = t-3$

$1 = t-3$, $-1 = t-3$

$t = 4$, $t = 2$

b) What is the maximum height reached by the flare?

83 m is the max height

c) After how many seconds does the flare reach its maximum height?

After 3 seconds.

d) What is the height of the flare after 2 seconds? From the graph: 74m

$h = -9(t-3)^2 + 83$ Use $t = 2$

$= -9(2-3)^2 + 83$

$= -9(1) + 83 = 74$ m. ∴ After 2 seconds the height was 74m.

e) Find another time that the flare is at the height in part d.

$t = 4$ seconds (same horizontal distance from $t = 3$)

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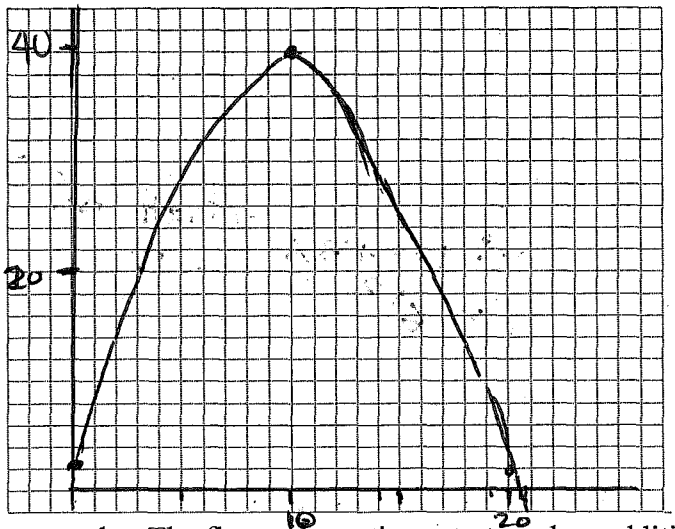
2. At a fireworks display, a firework display, a firework is launched from a height of 2 m above the ground and reaches a maximum height of 40 m at a horizontal distance of 10 m.

   a. Determine an equation to model the flight path of the firework.



Vertex (10, 40) (0, 2) POINT

(t, h)

$h = a(t-10)^2 + 40$

$2 = a(0-10)^2 + 40$

$2 = 100a + 40$

$-40 \quad -40$

$\frac{-38}{100} = \frac{100a}{100}$

$a = -\frac{19}{50} = -0.38$

   b. The firework continues to travel an additional 1 m horizontally, after it reaches its maximum height, before it explodes. What is its height when it explodes?

$h = ?$ $t = 11$

$\therefore h = -0.38(t-10)^2 + 40$

$h = -0.38(11-10)^2 + 40$

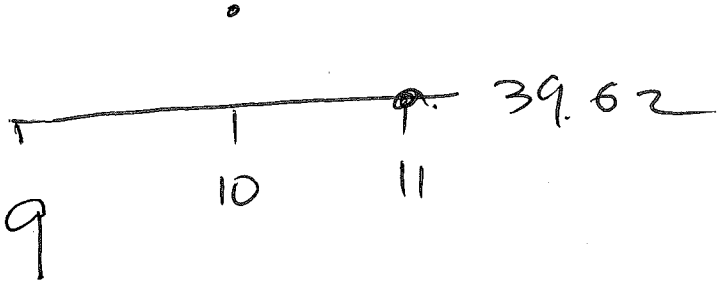
$= -0.38 + 40$

$= 39.62$ m.

∴ The height was 39.62 when it exploded.

   c. At what other horizontal distance is the firework at the same height as in part b)?

$t = 9$ seconds.



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