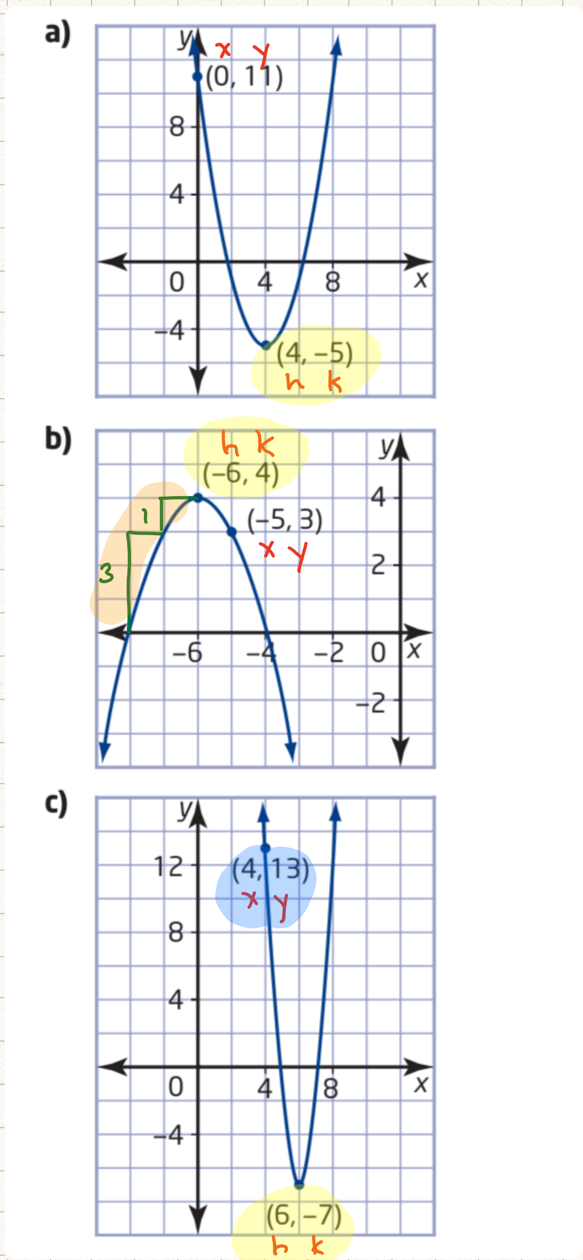
7.



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

$y = a(x-4)^2 - 5$

$11 = a(0-4)^2 - 5$

$11 = 16a - 5$

$+5 \qquad +5$

$\frac{16}{16} = \frac{16a}{16}$

$1 = a$

$a=1, h=4, k=-5$

$\therefore$ equation is

$y = (x-4)^2 - 5$

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

Regular step pattern (1, 3, ...) and opens down $\therefore a = -1$

$h = -6 \quad k = 4$

$\therefore$ equation is $y = -1(x-(-6))^2 + 4$

or $y = -(x+6)^2 + 4$

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

$13 = a(4-6)^2 - 7$

$13 = a(-2)^2 - 7$

$13 = 4a - 7$

$+7 \qquad +7$

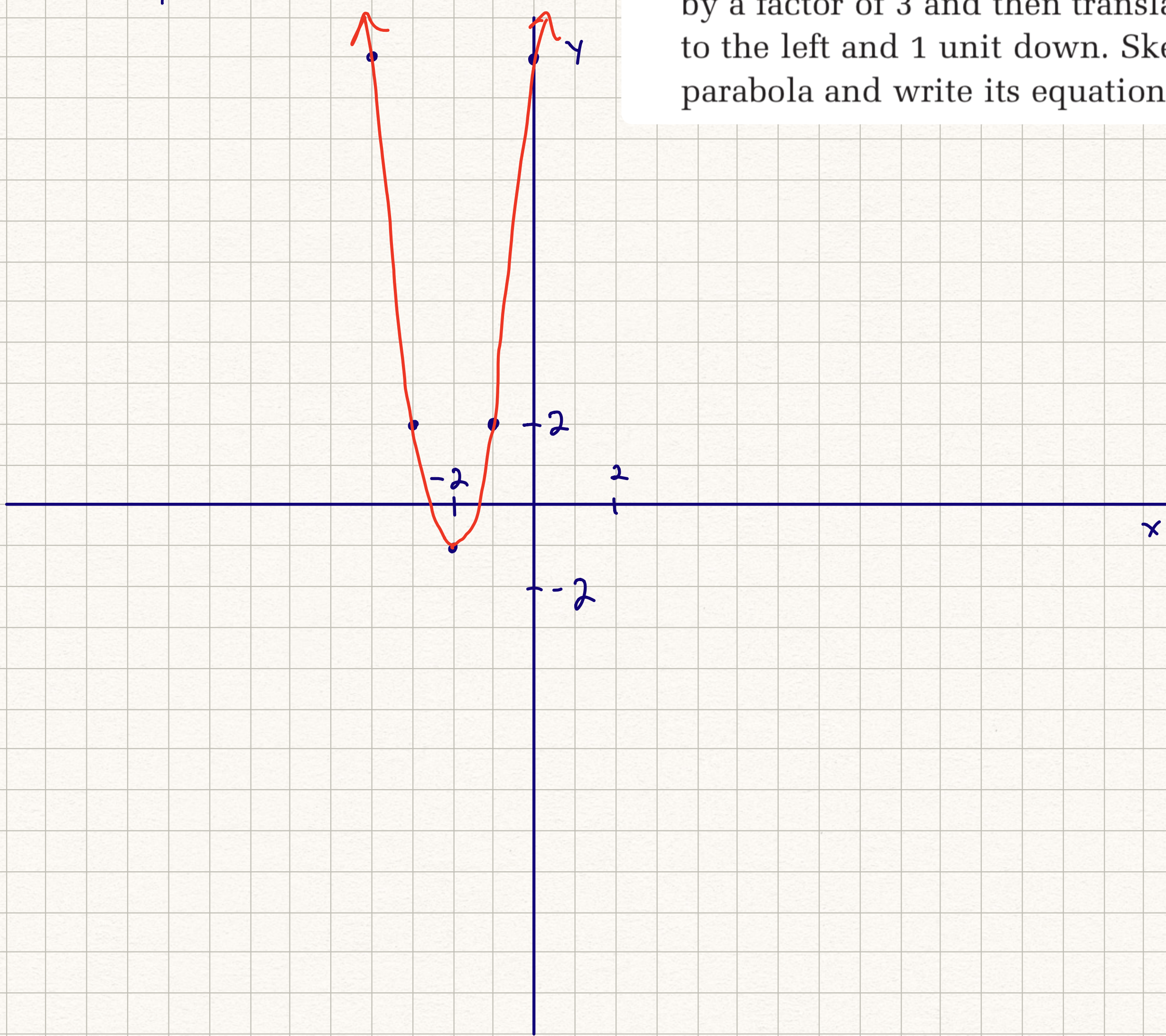
$\frac{20}{4} = \frac{4a}{4}$

$5 = a$

So... $y = a(x-h)^2 + k$

$y = 5(x-6)^2 - 7$

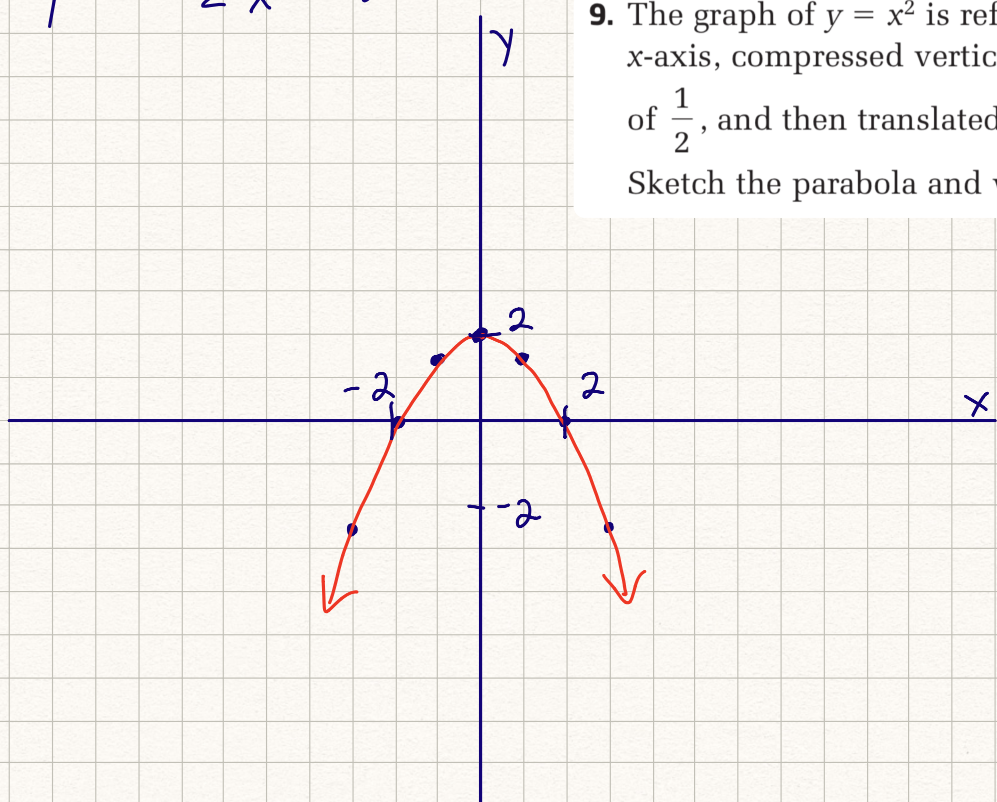
8. $y = 3(x+2)^2 - 1$



8. The graph of $y = x^2$ is stretched vertically by a factor of 3 and then translated 2 units to the left and 1 unit down. Sketch the parabola and write its equation.

9. $y = -\frac{1}{2}x^2 + 2$

9. The graph of $y = x^2$ is reflected in the x-axis, compressed vertically by a factor of $\frac{1}{2}$, and then translated 2 units upward. Sketch the parabola and write its equation.



10. a) Find an equation for the parabola with vertex $(\overset{h}{1}, \overset{k}{4})$ that passes through the point $(\underset{x}{3}, \underset{y}{8})$.

10a)

$$y = a(x-h)^2 + k$$
$$8 = a(3-1)^2 + 4$$
$$8 = a(2)^2 + 4$$
$$8 = 4a + 4$$
$$-4 \qquad -4$$
$$\frac{4}{4} = \frac{4a}{4}$$
$$1 = a$$

$$y = a(x-h)^2 + k$$
$$y = -1(x-1)^2 + 4$$

∴, equation is

$$y = (x-1)^2 + 4$$

b) Find an equation for the parabola with vertex $(\underset{h}{-2}, \underset{k}{5})$ and y-intercept 1. ← means $(\underset{x}{0}, \underset{y}{1})$

10 b)

$$y = a(x-h)^2 + k$$
$$1 = a(0-(-2))^2 + 5$$
$$1 = a(2)^2 + 5$$
$$1 = 4a + 5$$
$$-5 \qquad -5$$
$$\frac{-4}{4} = \frac{4a}{4}$$
$$-1 = a$$

$$y = a(x-h)^2 + k$$
$$y = -1(x-(-2))^2 + 5$$

∴ equation is

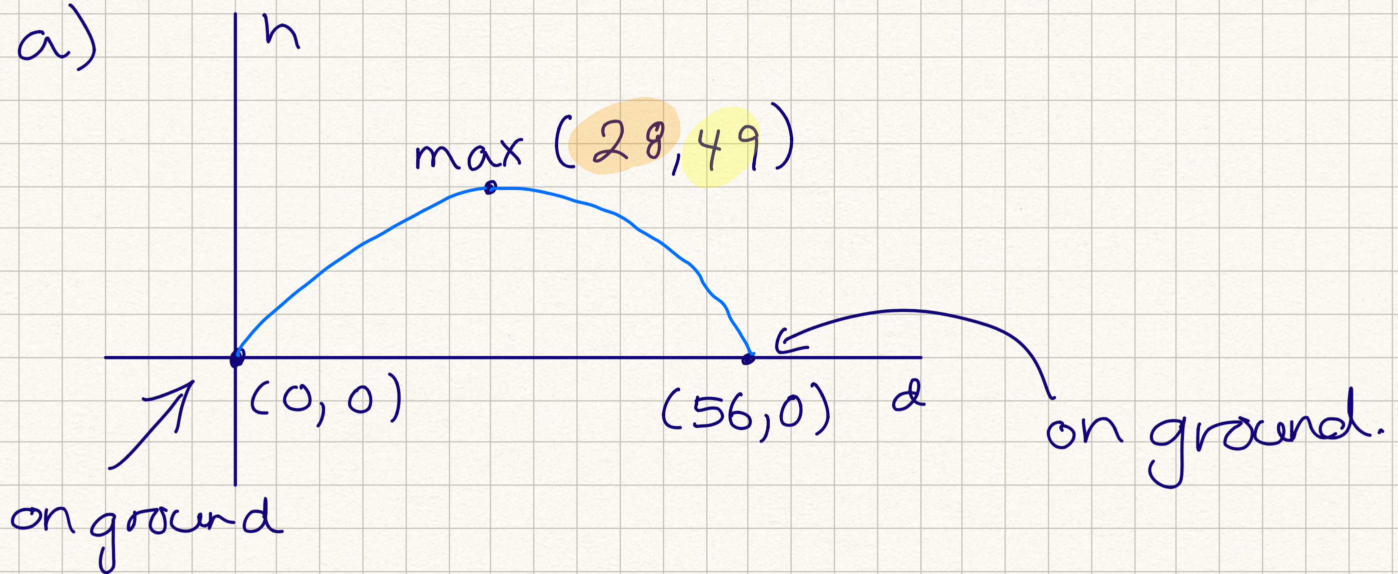
$$y = -(x+2)^2 + 5$$

11. $y = -\frac{1}{45}x^2 + 20$

→ opens down since "a" is negative. so cannot be C

→ shifted up 20 units so not A, must be B

12 a)



b) 49 metres

c) 28 metres

d) $h = -\frac{1}{16}(d-28)^2 + 49$

$h = -\frac{1}{16}(20-28)^2 + 49$

$h = -\frac{1}{16}(-8)^2 + 49$

$h = -\frac{1}{16}(64) + 49$

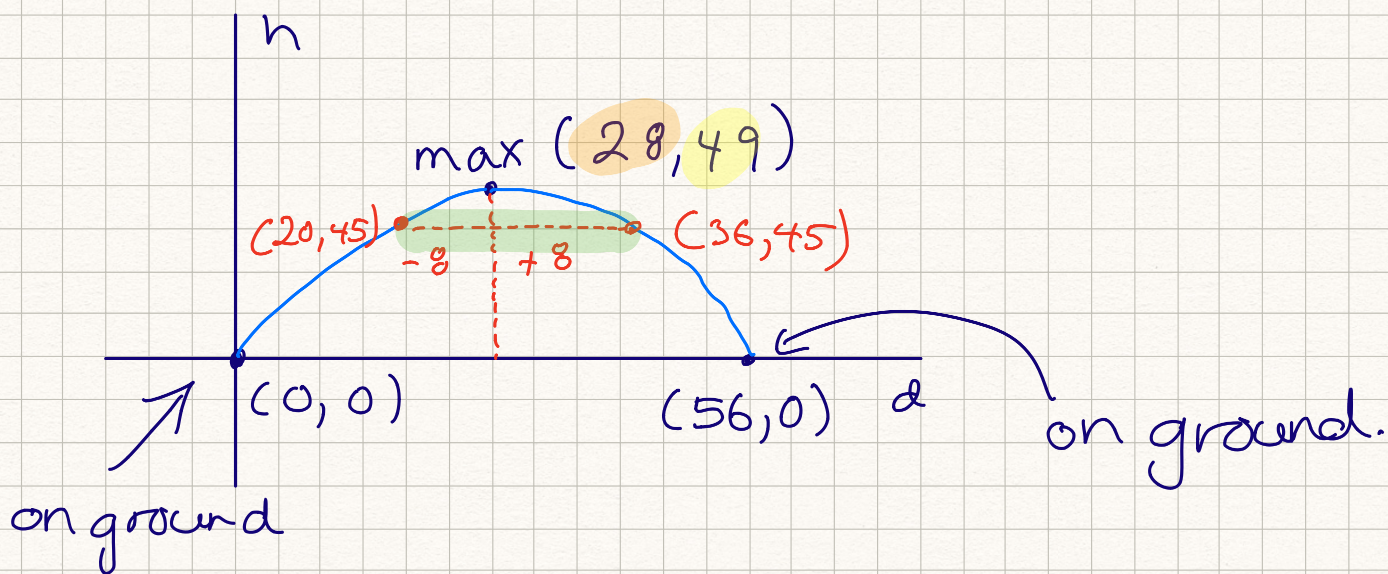
$h = -\frac{64}{16} + 49$

$h = -4 + 49$

$h = 45$

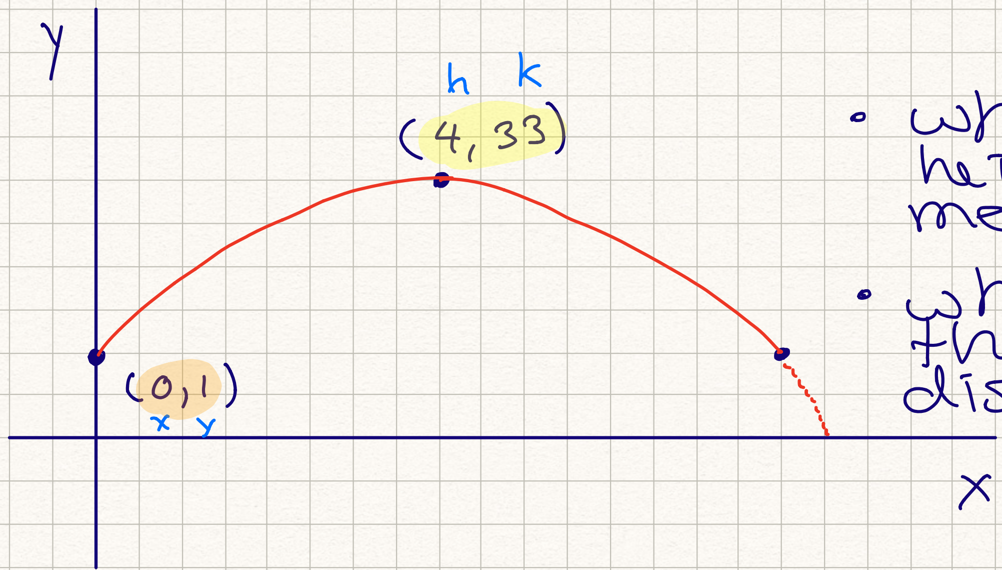
$\therefore$ the height of the ball after 20 metres (horizontally) is 45 m.

e) Since parabolas are symmetrical, the ball is 45 m high after 36 m of horizontal distance.



(see more on next page)

13.



- where y is the height in metres
- where x is the horizontal distance after the ball is hit.

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

$1 = a(0-4)^2 + 33$

$1 = 16a + 33$

$-33 \qquad -33$

$\frac{-32}{16} = \frac{16a}{16}$

$\boxed{-2 = a}$

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

∴, an equation to model the path of the baseball is

$y = -2(x-4)^2 + 33$

b) $y = -2(x-4)^2 + 33$

$y = -2(6-4)^2 + 33$

$y = -2(2)^2 + 33$

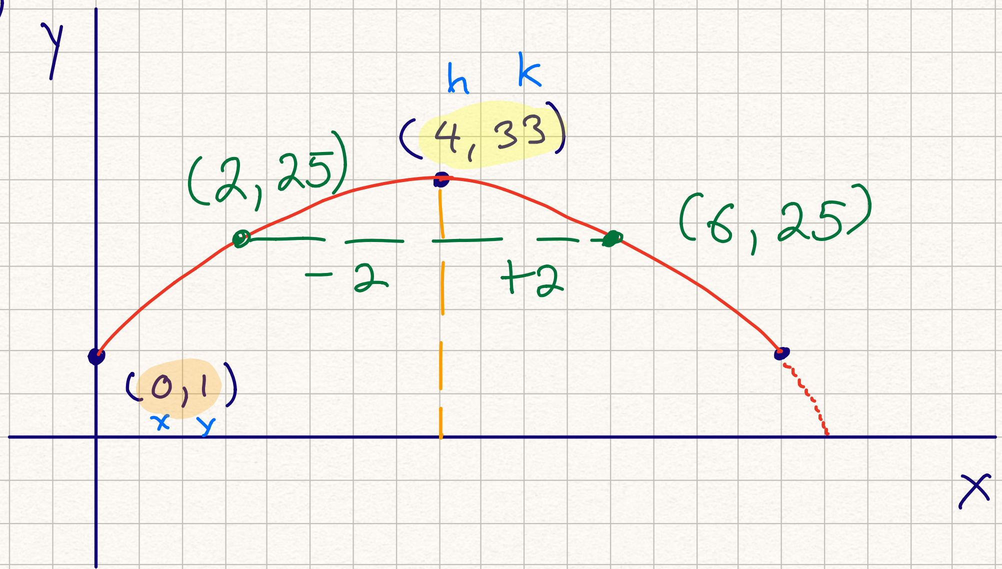
$y = -2(4) + 33$

$y = -8 + 33$

$y = 25$

∴ after 6 m of horizontal travel the ball is 25 metres high.

c)



∴, after 2 metres, the ball is also 25 metres high (since parabolas are symmetrical)