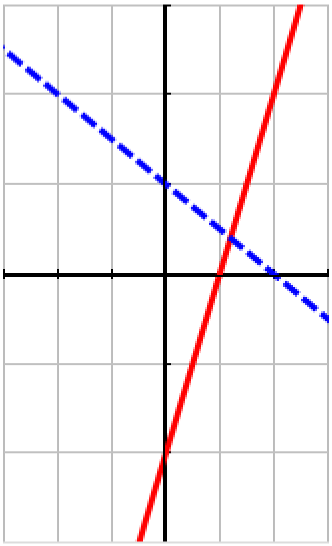
Y11 Context Graphs Practice #5

1. The solid line opposite has equation

$$y = k\,x - c$$

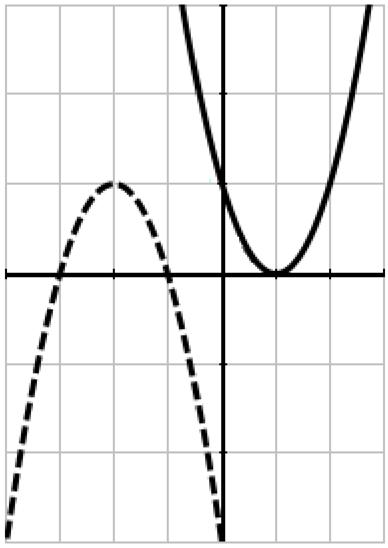
Write the equation of the dotted line in terms of k and c.

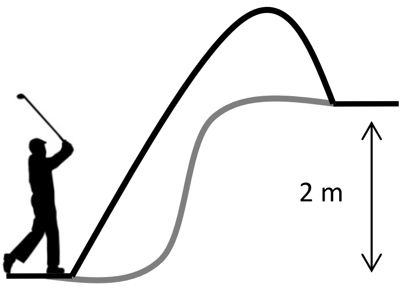


2. The solid parabola opposite has equation

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

Write the equation of the dotted parabola in terms of k and a.





3. A golfer chips the ball out of a bunker to a green above him so that it has a flight path given by:

$$h = 1.2d - 0.1d^2$$

where h is ball's height in metres (with his ground level being zero height)

and d is the distance travelled in metres

a How high does the ball get above his ground level?

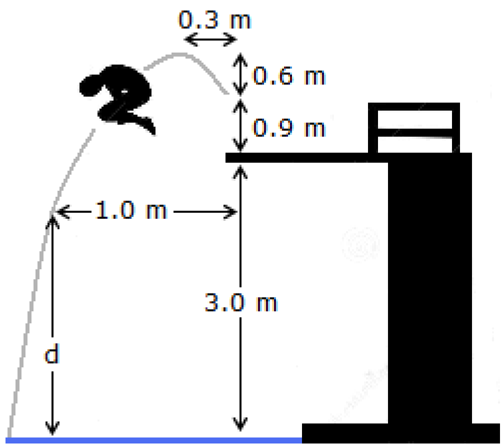
b If the green's level is two metre above his, how far has the ball travelled horizontally before it lands?

4. A diver stands on a 3 m springboard.

His centre of gravity starts 0.9 m above the board.

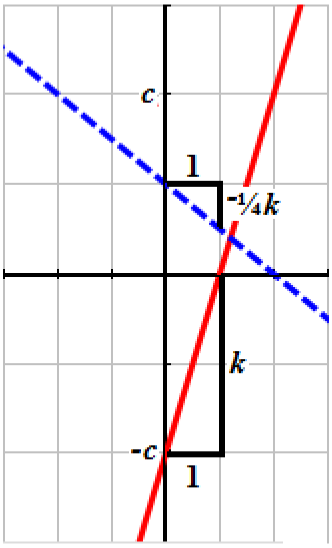
He springs and tucks so that at the top of his flight his centre is 0.6 m higher, and 0.3 m out.

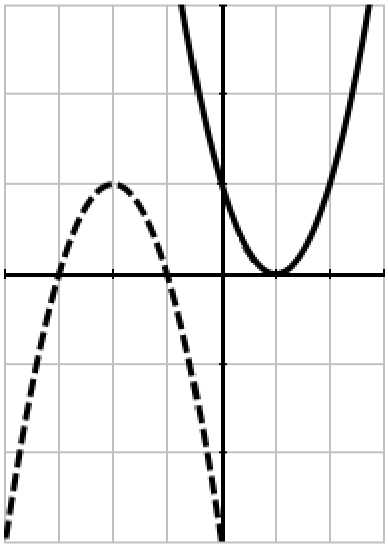
After he has travelled 1 m horizontally, how far will his centre of gravity be above the water? (The distance marked "d".)



.

Answers: Y11 Context Graphs Practice #5





1. $y = {}^{-}\tfrac{1}{4}\,k\,x + \tfrac{1}{2}\,c$

   or $\boldsymbol{y = -0.25k\,x + 0.5c}$

   For each unit across the gradient is going down (so negative) a quarter as fast.

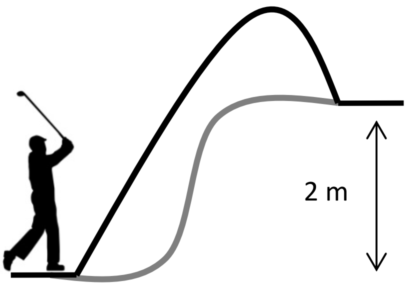
2. Negative now, and twice as far over:

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

   The h is where the original parabola crosses the y axis, so

   $h = k(0 + a)^2 = ka^2$

   Putting this in gives $\boldsymbol{y = -k(x - 2a)^2 + ka^2}$



3. Need to factorise the equation to use it properly:

   $h = 1.2d - 0.1d^2 = 0.1\,d\,(12 - d)$

   a The maximum height is halfway between the d intercepts at $d = 0$ and $d = 12$, so at $d = 6$

   $h_{max} = 1.2 \times 6 - 0.1 \times 6^2 =$ **3.6 m high**

   b Need to solve $2 = 1.2d - 0.1d^2$

   $0.1d^2 - 1.2d + 2 = 0 \Rightarrow \quad d^2 - 12d + 20 = 0$

   $(d - 10)(d - 2) = 0 \quad d = 2$ or 10,

   so **10 metres** in this context.

4. Let the start point be (0,0), we can use symmetry to see (–0.6, 0) is horizontal to it.

   So $h = k\,x(x + 0.6)$ models the dive

   The high point is (–0.3, 0.6), so $0.6 = k \times -0.3\,(-0.3 + 0.6)$, $\Rightarrow k = {}^{-20}/_3$ (-6.6666)

   $\boldsymbol{h = {}^{-20}/_3\,x(x + 0.6)}$

   Putting in $x = -1$, $h = {}^{-20}/_3 \times -1\,(-1 + 0.6) = {}^{-8}/_3$ (-2.6666)

   Taking that from 3.9 m starting height, gives him **1.233 m above the water**

   Or using turning point method, and making (0, 4.5) the turning point.

   $h = k\,x^2 + 4.5$ and $k = {}^{-20}/_3$ as $3.9 = k \times 0.3^2 + 4.5$ as start of the dive is (0.3, 3.9)

   $\boldsymbol{h = {}^{-20}/_3\,x^2 + 4.5}$

   Putting in $x = 0.7$ (from 1 – 0.3), $h = {}^{-20}/_3 \times 0.7^2 + 4.5 =$ **1.23 metres**