

Lancio del peso: Torrance vs Profeti

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```
In[1]:= SetOptions[
  {
    Plot,
    ListPlot, ParametricPlot,
    ListLinePlot
  },
  TicksStyle -> Directive[
    Hue[5 / 6],
    8
  ]
];

In[2]:= xA = 16.9; yA = -2; g = 9.8;

In[3]:= A = Point[{xA, yA}];

In[4]:= (*Calcolo la velocità iniziale*)

In[5]:= s = Solve[ $yA == \frac{v0^2}{2 * g} - \frac{g}{2 * v0^2} * xA^2$ ]

Out[5]:= {{v0 -> -12.1316}, {v0 -> 0. - 13.6519 I}, {v0 -> 0. + 13.6519 I}, {v0 -> 12.1316}}

In[6]:= v0 = v0 /. s[[4]]

Out[6]:= 12.1316

In[7]:= (*calcolo l'angolo di lancio*)

In[8]:=  $\theta0 = \frac{\pi}{4} + \frac{1}{2} \text{ArcTan}\left[\frac{yA}{xA}\right]$ 

Out[8]:= 0.726501

In[9]:= % *  $\frac{180}{\pi}$ 

Out[9]:= 41.6254

In[10]:= (*Calcolo la gittata di Torrance*)

In[11]:=  $R = \frac{v0^2}{g} \text{Sin}[2 * \theta0]$ 

Out[11]:= 14.9139

In[12]:= (*ci servirà sul grafico*)

In[13]:= B = Point[{R, 0}];

In[14]:= (*calcolo l'angolo di lancio di Profeti*)

In[15]:= xA1 = 14.87;
```

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In[16]:=  $\theta 1 = \frac{\pi}{4} + \frac{1}{2} \text{ArcTan}\left[\frac{yA}{xA1}\right]$ 
```

```
Out[16]= 0.71855
```

```
In[17]:=  $\% * \frac{180}{\pi}$ 
```

```
Out[17]= 41.1699
```

```
In[18]:= (*involuppo Torrence*)
```

```
In[19]:= inv[x_] := Which[
    x ≥ 0 && x ≤ xA,  $\frac{v\theta^2}{2 * g} - \frac{g}{2 * v\theta^2} * x^2$ ,
    x < 0 || x > xA, Null
]
```

```
In[20]:= (*parabola Torrence*)
```

```
In[21]:= torrance[x_] := Which[
    x ≥ 0 && x ≤ xA,  $x * \text{Tan}[\theta 0] - \frac{g}{2 * v\theta^2 * \text{Cos}[\theta 0]^2} * x^2$ ,
    x < 0 || x > xA, Null
]
```

```
In[22]:= (*velocità iniziale di Profeti*)
```

```
In[23]:= s = Solve[yA ==  $\frac{v\theta 1^2}{2 * g} - \frac{g}{2 * v\theta 1^2} * xA1^2$ ]
```

```
Out[23]= {{v01 → -11.2889}, {v01 → 0. - 12.9088 i}, {v01 → 0. + 12.9088 i}, {v01 → 11.2889}}
```

```
In[24]:= v01 = v01 /. s[[4]]
```

```
Out[24]= 11.2889
```

```
In[25]:= (*parabola Profeti*)
```

```
In[26]:= profeti[x_] := Which[
    x ≥ 0 && x ≤ xA1,  $x * \text{Tan}[\theta 1] - \frac{g}{2 * v\theta 1^2 * \text{Cos}[\theta 1]^2} * x^2$ ,
    x < 0 || x > xA1, Null
]
```

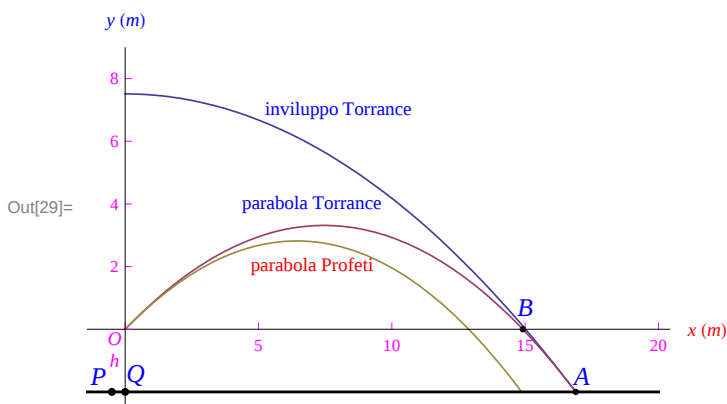
```
In[27]:= (*punti notevoli della pedana*)
```

```
In[28]:= P = Point[{-0.5, -2}]; Q = Point[{0, -2}];
```

```

In[29]:= Plot[
  {inv[x], torrance[x], profeti[x]},
  {x, -1, 20},
  PlotRange → {-2.5, 9},
  PlotStyle → Thickness[0.0028],
  AxesLabel →
    {
      Style["x (m)", Small, Red, Italic],
      Style["y (m)", Small, Blue, Italic]
    },
  Epilog → {
    {
      A, B,
      {
        PointSize[0.014],
        P,
        Q
      },
      Thickness[0.005],
      Line[{{-2, -2}, {20, -2}}]
    },
    Text[Style["0", Small, Magenta, Italic], {-0.4, -0.3}],
    Text[Style["h", Small, Magenta, Italic], {-0.4, -1}],
    Text[Style["A", Medium, Blue, Italic], {17.1, -1.5}],
    Text[Style["B", Medium, Blue, Italic], {15, 0.7}],
    Text[Style["P", Medium, Blue, Italic], {-1, -1.5}],
    Text[Style["Q", Medium, Blue, Italic], {0.4, -1.5}],
    Text[Style["inviluppo Torrance", Small, Blue], {8, 7}],
    Text[Style["parabola Torrance", Small, Blue], {7, 4}],
    Text[Style["parabola Profeti", Small, Red], {7, 2}]
  },
  Ticks →
    {
      Table[k, {k, 0, 20, 5}],
      Table[k, {k, 0, 8, 2}]
    }
]

```



```

In[30]:= torrance2[x_, θ_] := x * Tan[θ] -  $\frac{g}{2 * v0^2 * Cos[θ]^2}$  * x^2

```

```

In[31]:= s1 = Solve[torrance2[x, π / 4] == yA, x]

```

```

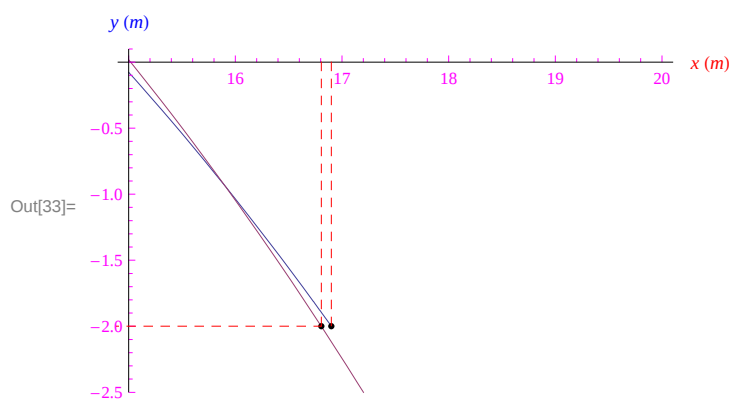
Out[31]= {{x → -1.78729}, {x → 16.8052}}

```

```
In[32]:=  $\xi A = x /. s1[[2]]$ 
```

```
Out[32]= 16.8052
```

```
In[33]:= Plot[
  {torrance[x], torrance2[x,  $\pi/4$ ]},
  {x, 15, 20},
  PlotRange  $\rightarrow$  {-2.5, 0.1},
  Epilog  $\rightarrow$  {
    A, Point[{ $\xi A$ , -2}],
    Red,
    Dashed,
    Line[{xA, 0}, {xA, torrance[xA]}],
    Line[{ $\xi A$ , 0}, { $\xi A$ , torrance2[ $\xi A$ ,  $\frac{\pi}{4}$ ]}],
    Line[{0, torrance2[ $\xi A$ ,  $\frac{\pi}{4}$ ]}, { $\xi A$ , torrance2[ $\xi A$ ,  $\frac{\pi}{4}$ ]}]
  },
  AxesLabel  $\rightarrow$ 
  {
    Style["x (m)", Small, Red, Italic],
    Style["y (m)", Small, Blue, Italic]
  }
]
```



```
Export["torrance1.eps", %]
```

```
torrance1.eps
```