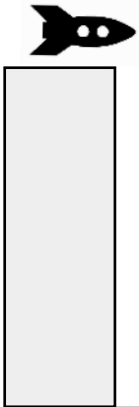# Higher Physics

PROJECTILES

What is meant by a projectile?

This is the definition of an object which fired horizontally or at an angle and is subject to two distinct motions.
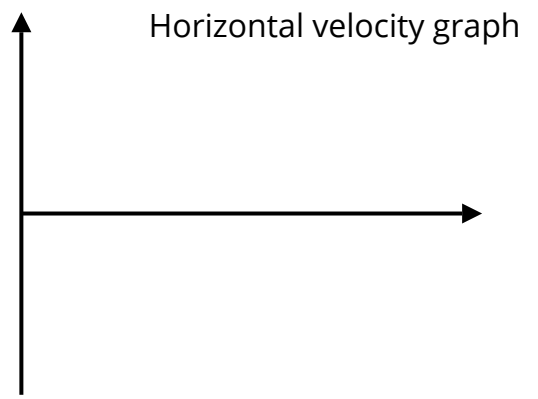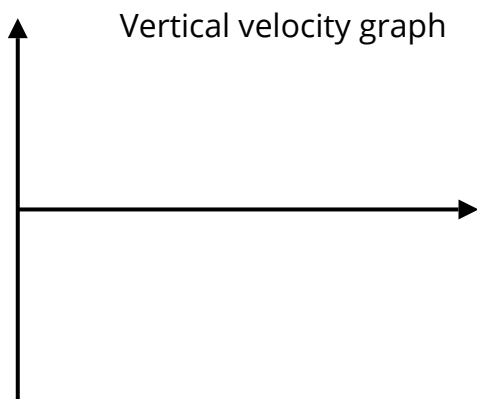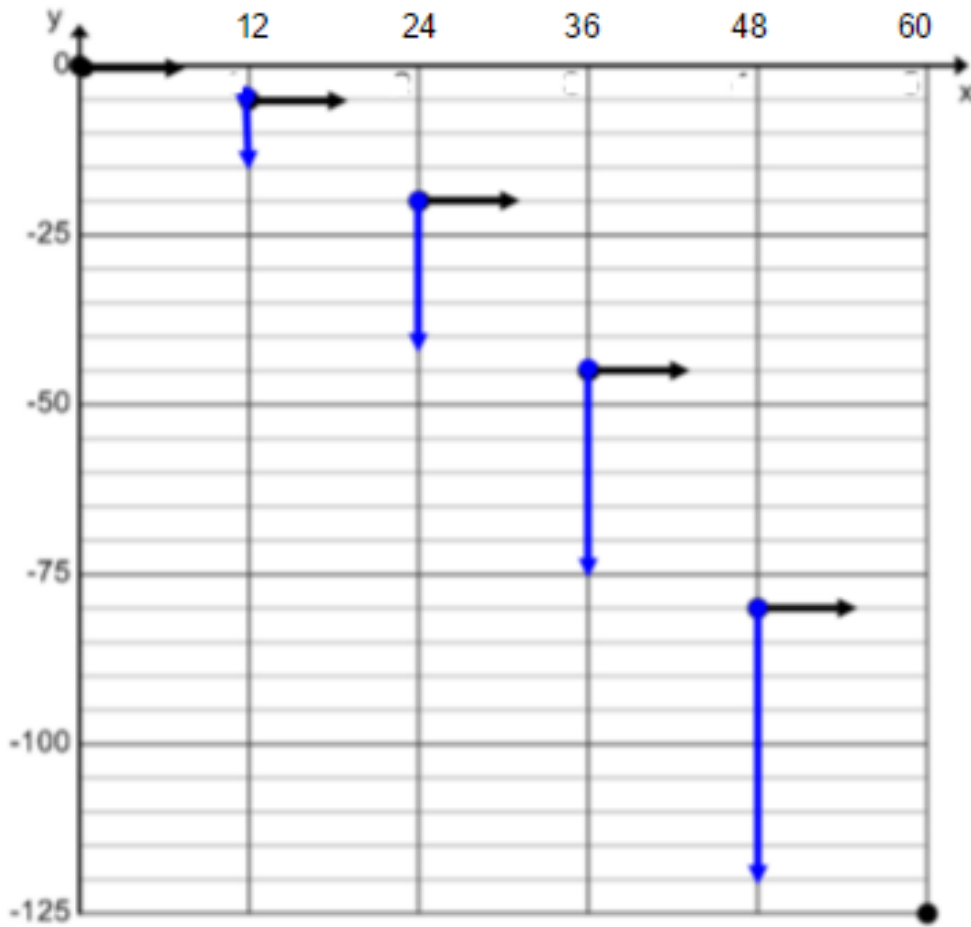
Horizontal Projectile

Angled Projectile

Higher Physics   PROJECTILES

Horizontal Projectile

The picture below shows position of a ball rolled off a table.. The arrows represent the velocity vectors.

Horizontal vectors ....

Vertical vectors ....

Vertical velocity graph

Horizontal velocity graph

Higher Physics   PROJECTILES

Horizontal Projectile

To solve horizontal projectile problems we need to split the motion into the two distinct sets: **VERTICAL & HORIZONTAL**

VERTICAL MOTION

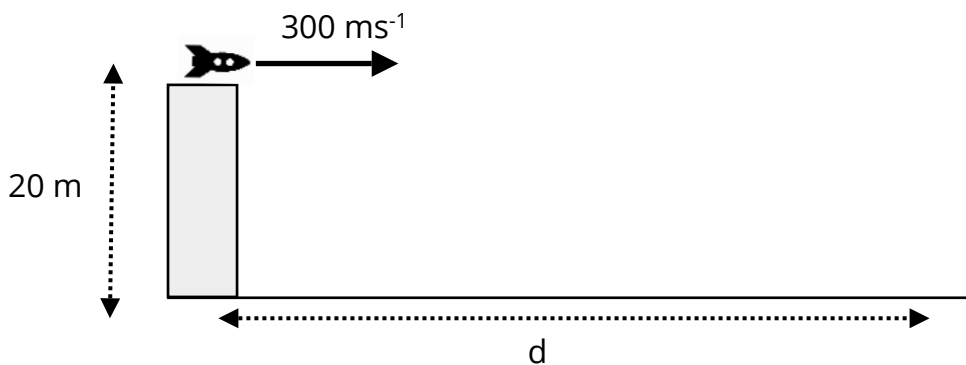(Affected by the acceleration of gravity)

U
v
a
S
t

HORIZONTAL MOTION

(Not affected by acceleration of gravity)

Distance = speed x time

**Example 1**   A rocket is launched horizontally with a speed of 300 ms^{-1}. It is launched from a height of 20 m. Determine the distance it lands from the foot of the launch tower.

300 ms^{-1}

20 m

d

Higher Physics

PROJECTILES

Example 2
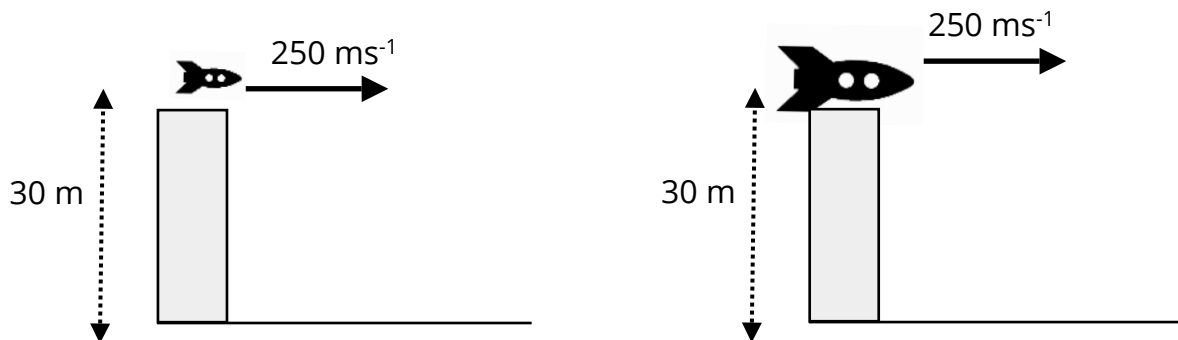
A rocket is launched horizontally with a speed of 250 ms^{-1}. It lands 800 m from the foot of the launch tower.

Determine the height of the launch tower.

250 ms^{-1}

h

800 m
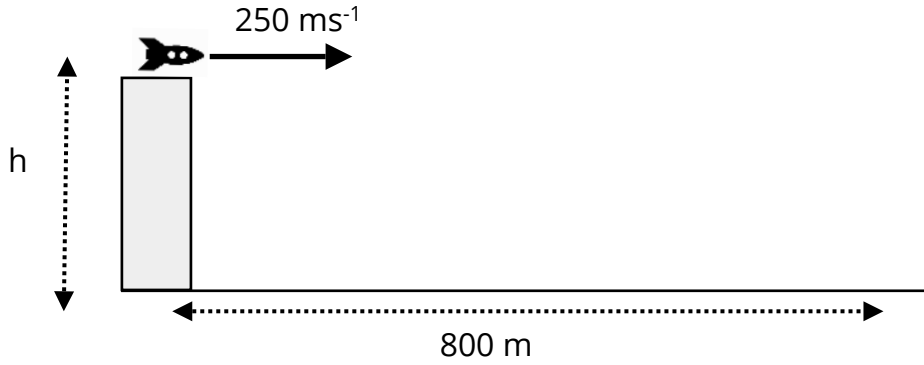
Example 2

Which rocket will land the furthest from the foot of the launch tower?

250 ms^{-1}

30 m

250 ms^{-1}

30 m

Higher Physics

PROJECTILES

Angled Projectiles.

The diagram below shows a rocket launched at an angle of 30° from the horizontal.

100 ms^{-1}

30°

The velocity vector can be resolved into the horizontal component and the vertical components.

These components can be placed in the vertical and horizontal templates for a projectile.

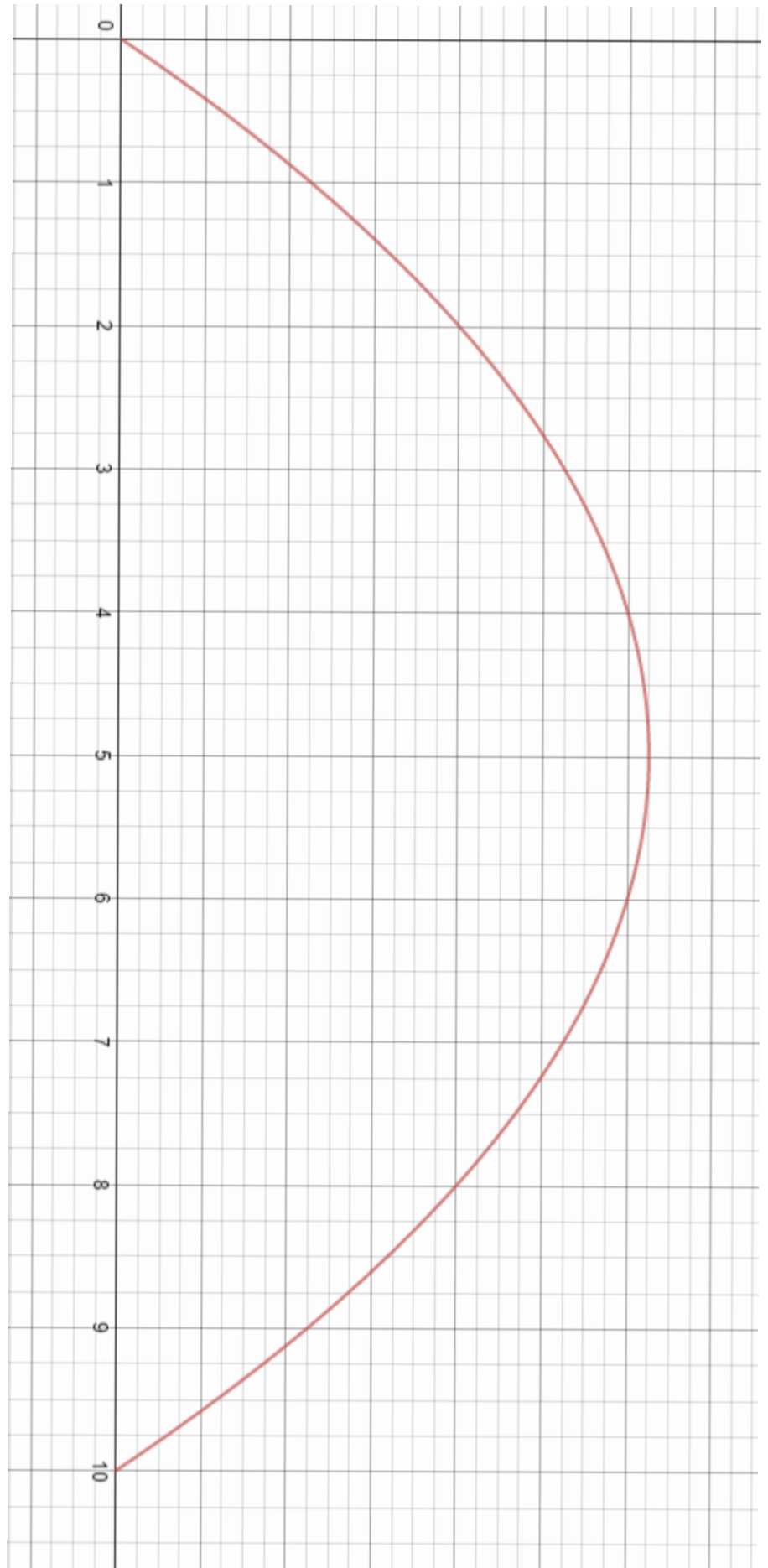Only the **vertical velocity** is affected by the acceleration of gravity.

100 ms^{-1}

30°
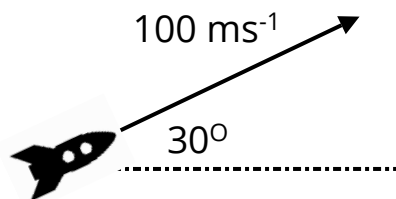
Vertical Info

Horizontal Info

PROJECTILES

For simplicity take acceleration of gravity to be 10 ms^{-2} downwards.

Time	Vertical velocity	Horizontal velocity
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Angled Projectiles Example 1.

A rocket is launched into the air with a velocity of 100 ms^{-1} at an angle of 30°
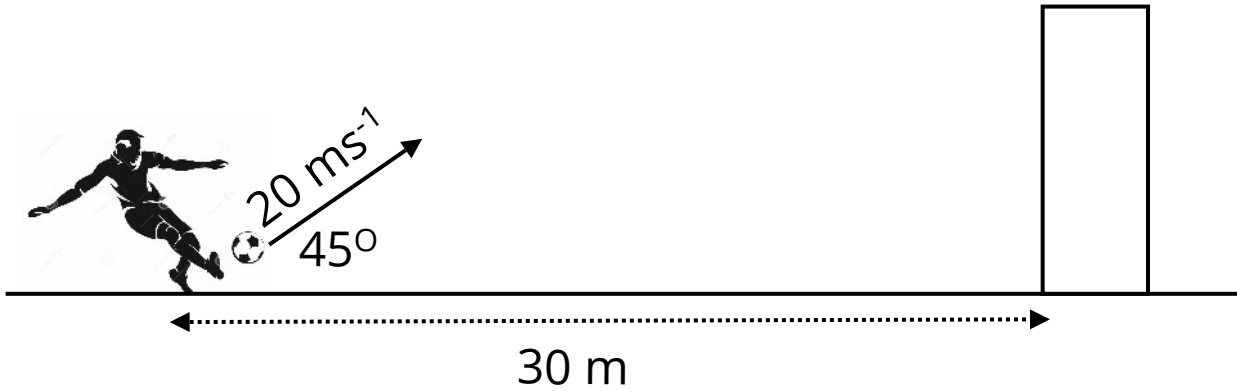

100 ms^{-1}

30°
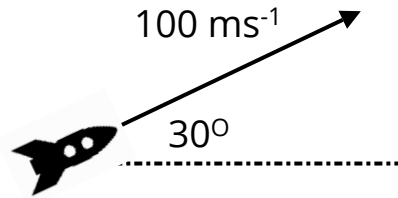
Calculate the maximum height the rocket reached

How long was the rocket in the air?

How far horizontally (called the **range**) did the rocket travel.

Angled Projectiles Example 2.

A footballer kicks a ball with a velocity of 20 ms^{-1} at 45° towards a wall which is 30 m away.

30 m

Find the horizontal and vertical components of the ball`s velocity.

Find out the time it took for the ball to strike the wall and how high up the wall did it strike?