Projectiles 1

1.

An object is projected horizontally at a speed of 16 m s^{-1} into the sea from a cliff top of height 45.0 m. Calculate:

a how long it takes to reach the sea,

b how far it travels horizontally,

c its impact velocity.

2.

A dart is thrown horizontally along a line passing through the centre of a dartboard, 2.3 m away from the point at which the dart was released. The dart hits the dartboard at a point 0.19 m below the centre. Calculate:

a the time of flight of the dart,

b its horizontal speed of projection.

3.

A parcel is released from an aircraft travelling horizontally at a speed of 120 m s^{-1} above level ground. The parcel hits the ground 8.5 s later. Calculate:

a the height of the aircraft above the ground,

b the horizontal distance travelled in this time by i the parcel, ii the aircraft,

c the speed of impact of the parcel at the ground.

4.

A cannonball fired horizontally from a seaside tower hit the sea 2.7 s later at a distance of 58 m away from the foot of the tower. Calculate:

a the horizontal component of velocity of the cannon ball at the instant it was fired,

b the height of the tower above the sea,

c the speed of impact of the cannonball at the sea.

5.

A cable car was travelling at a speed of 4.6 m s^{-1} in a direction 40° above the horizontal, when an object was released from the cable car (Figure 5).

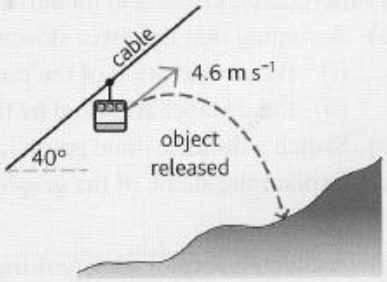


Figure 5

a Calculate the horizontal and vertical components of velocity of the object at the instant it was released.

b The object took 5.8 s to fall to the ground below. Calculate i the distance fallen by the object from the point of release, ii the horizontal distance travelled by the object from the point of release to where it hit the ground.

6.

A pencil is knocked horizontally off the edge of a desk at 2.0 m s^{-1}. The desk is 65 cm high.

a) How long does it take the pencil to reach the floor? Ignore air resistance.

b) What horizontal distance does the pencil travel during this time?

7.

An aid parcel is released from a plane flying horizontally at 60 m s^{-1}. It is at a height of 1000 m

a) What are the horizontal and vertical component of the parcel's initial velocity?

b) How long does the parcel take to hit the ground? Ignore air resistance.

c) At what horizontal distance should the plane be from the target when the parcel is released?

8.

A golf ball is hit at 26 m s^{-1} at 45° to the ground. Ignoring air resistance:

a) How long is the ball in the air?

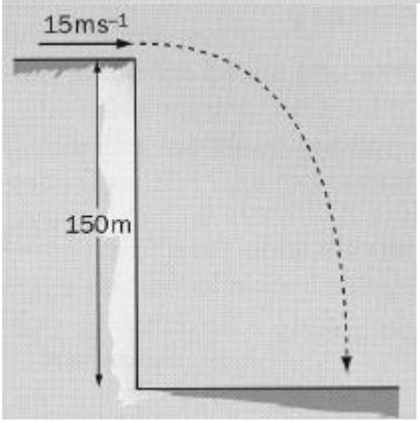
b) How far does the ball travel horizontally?

c) What is the maximum height the ball reaches during its flight?

(More Question on Page 2)

9.

A stone is thrown over the edge of a cliff with a horizontal velocity of 15 m s^{-1}. The cliff is 150 m high.
Ignoring any air resistance and taking $g = 10$ m s^{-2}, calculate:
a) the time it takes for the stone to reach the ground,
b) the distance it lands from the foot of the cliff,
c) the magnitude of the stone's velocity when it hits the ground.



10.

A golfer hits a ball so that it moves off with a velocity of 26 m s^{-1} at 30° to the horizontal.
Ignoring any air resistance and taking $g = 10$ m s^{-2}, calculate:
a) the time that the ball is in the air, and
b) the horizontal distance the ball travels.