

Projectiles and relative motion in a plane

AP Physics 1 (algebra-based) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test lasts 45 minutes and is worth 20 points. Use $g = 9.81 \text{ m/s}^2$, show all working and include units. Calculators are allowed.

Level: AP Physics 1 (algebra-based) · **Curriculum:** AP P1 Unit 1

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Acceleration at the top (1 mark)

State the acceleration of a projectile at the highest point of its path. (1 mark)

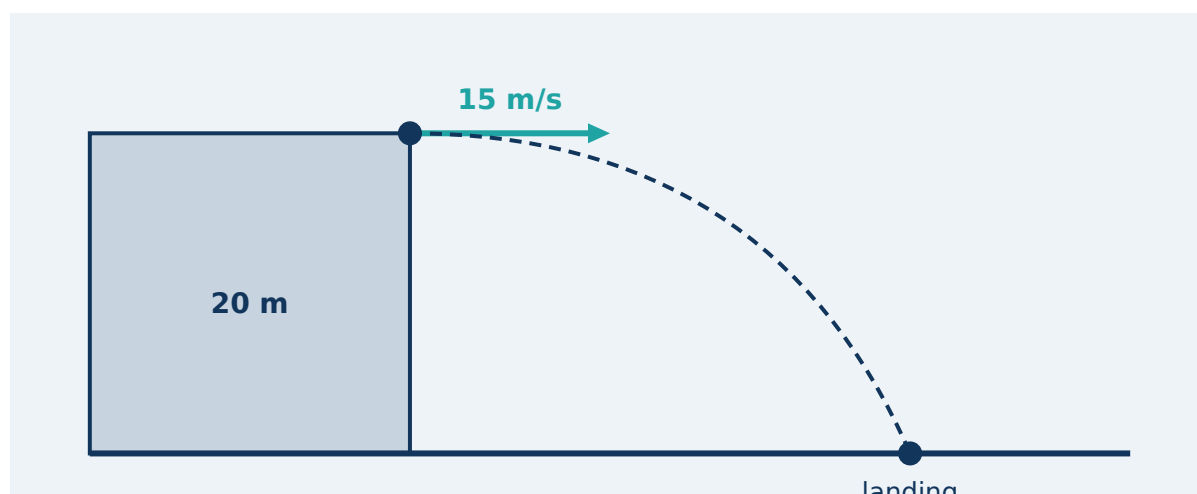
Question 2 Horizontal velocity (1 mark)

State why the horizontal velocity of a projectile is constant. (1 mark)

Question 3 Cliff throw (5 marks)

A ball is thrown horizontally at 15 m/s from a cliff 20 m high (see the figure).

- Calculate the time to reach the ground. (2 marks)
- Calculate the horizontal distance from the cliff to the landing point. (1 mark)
- Calculate the speed of the ball just before it lands. (2 marks)



A ball is thrown horizontally from a cliff top.

Question 4 Components (2 marks)

A velocity of 24 m/s is directed 35° above the horizontal.

- Calculate the horizontal component. (1 mark)
- Calculate the vertical component. (1 mark)

Question 5 Boat on a river (3 marks)

A boat heads straight across a river at 4.0 m/s relative to the water. The current flows at 3.0 m/s and the river is 100 m wide.

- Calculate the crossing time. (1 mark)
- Calculate the downstream drift. (1 mark)
- Calculate the speed relative to the bank. (1 mark)

Question 6 Kicked ball (4 marks)

A ball is kicked from level ground at 22 m/s, 45° above the horizontal.

- Calculate the time of flight. (2 marks)
- Calculate the range. (2 marks)

Question 7 Explain the landing (2 marks)

Two identical balls leave the edge of a table together. One is dropped and the other is pushed horizontally. Explain why they hit the floor at the same time. (2 marks)

Question 8 Equal ranges (2 marks)

A cannon fires a shell at 30° and then, with the same speed, at 60° . Predict how the two ranges compare and explain. (2 marks)