

12/15

B4 Trajectories

Complete the values in the table below, assuming that all projectiles are launched horizontally and fall downwards with an acceleration of 9.8 m s^{-2} .

	Horizontal distance* /m	Horizontal speed /m s ⁻¹	Time to target /s	Distance fallen /m
B4.1	4.0	4.0	(a)	(b)
B4.2	(a)	20.0	(b)	0.020
B4.3	86	220	(a)	(b)
B4.4	1.5	(a)	(b)	0.32
B4.5	(a)	280	(b)	6300

* to target

- B4.6 You shoot horizontally at a target that is 30 m away with a gun which fires a bullet at 150 m s^{-1} . How high must the gun be above the target in order to hit it?
- B4.7 You are trying to drop essential survival supplies from an aeroplane to help the survivors of a crash who are stranded. You are flying 300 m above them, and your aircraft can travel no slower than 30 m s^{-1} . You fly on a straight line which will pass over the survivors. How far (in metres) in advance of overflying the survivors do you need to drop the package?
- B4.8 A rugby player is aiming for a conversion. They kick the ball at 15 m s^{-1} at an angle of 50° to the horizontal. At the time, they are 20 m from the posts.
- How long will the ball take to reach the posts?
 - How high will the ball be when it reaches the posts?
- B4.9 A cricketer bats a ball at a speed of 27 m s^{-1} at an angle of 60° to the horizontal. How far away would you have to stand in order to catch it, assuming you want to catch it just before it hits the ground?