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## Type I Projectiles

1. A ball is pushed off of a 120.0 m building at a horizontal velocity of $16.0 \mathrm{~m} / \mathrm{s}$. Determine
a. the time it takes to reach the ground.
b. the distance the ball lands away from the building at the ground level.
c. the vertical velocity if the ball just before it hits the ground.
d. the total velocity the ball reaches just before it hits the ground below the building.
2. A physics student drops a steel ball out of a car window. The car's speed is $40.0 \mathrm{~m} / \mathrm{s}$. The height of the window is 1.30 m . Calculate
a. the time it takes for the ball to hit the ground.
b. the horizontal distance traveled by the ball while falling.
c. the vertical velocity of the ball as it hits the ground.
d. the overall speed of the ball as it hits the ground.
3. A cliff diver is on a 30.0 m high cliff. With what velocity should they leave the cliff, (assume the person jumps out horizontally) in order to miss 8.0 m of rock coming from the cliff's base?

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4. A mountain goat butts you off a 50.0 m high cliff with a horizontal velocity of $3.0 \mathrm{~m} / \mathrm{s}$. How far from the base will you strike the ground?
5. A stunt person jumps at $5.0 \mathrm{~m} / \mathrm{s}$ horizontally, if she just lands on an airbag 24.2 m from the base of a building how high was the building?
6. A flying squirrel leaps off a building of height 30.0 m . If it left the building with a horizontal velocity of 1.0 $\mathrm{m} / \mathrm{s}$ will it land safely on some garbage bags 5.0 m from the base of the building?
7. A physics student runs at $6.0 \mathrm{~m} / \mathrm{s}$ horizontally off a 10.0 m high diving board. What will be her range when landing in the water below?
8. A rock is tossed off a bridge horizontally at $9.0 \mathrm{~m} / \mathrm{s}$ and strikes the ground below 3.2 s later. How high is the bridge and what was the range of the throw?
9. A rifle is shot horizontally at $300 \mathrm{~m} / \mathrm{s}$ from a height of 1.8 m . What is the maximum distance the bullet will travel before hitting the ground?
10. Water sprays horizontally out of a shower head which is 2.12 m above the ground. If the water hits the shower floor 0.85 m from the wall of the shower how fast was the water coming out the showerhead?
11. A supply plane flying at $250 \mathrm{~m} / \mathrm{s}$ releases supplies 3900 m in front of survivors of a shipwreck. How high is the plane?

Answers: 1a) 4.95 s , b) $79.2 \mathrm{~m}, ~ c) ~ 48.5 \mathrm{~m} / \mathrm{s}$, d) $51.1 \mathrm{~m} / \mathrm{s}$, 2a) 0.52 s , b) $20.8 \mathrm{~m}, ~ c) 40 \mathrm{~m} / \mathrm{s}$, d) $40.3 \mathrm{~m} / \mathrm{s}, 3) 3.23 \mathrm{~m} / \mathrm{s}$, 4) 9.58 m, 5) $115 \mathrm{~m}, 6) \mathrm{no}, 2.47 \mathrm{~m}, 7) 8.57 \mathrm{~m}, 8) \mathrm{h}=50.2 \mathrm{~m}, \mathrm{r}=28.8 \mathrm{~m}, 9) 182 \mathrm{~m}, 10) 1.29 \mathrm{~m} / \mathrm{s}, 11) 1.19 \times 10^{3} \mathrm{~m}$

