Linear motion I

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Take $g = 10\,\mathrm{m\,s^{-2}}$ where necessary.

1. A stone is dropped off the edge of a cliff. How long does it take to fall into the sea 78.4 m below?
2. A car accelerates from $8\,\mathrm{m\,s^{-1}}$ to $32\,\mathrm{m\,s^{-1}}$ in 8 seconds. What is the acceleration of the car?
3. While braking from $50\,\mathrm{m\,s^{-1}}$ to $10\,\mathrm{m\,s^{-1}}$ a train covers a distance of 600 m. What is the deceleration of the train?
4. A stone is thrown vertically upwards. It takes 3 seconds to return to the ground. What was the maximum height reached? (Hint: think about what you know about the motion at the instant when the stone is at its maximum height)
5. A ball is thrown vertically upwards with an initial velocity of $50\,\mathrm{m\,s^{-1}}$. How far above the release point is the ball 1 s before falling back?
6. In the electron gun of a TV tube, an electron is accelerated from rest to a speed of $4.0 \times 10^7\,\mathrm{m\,s^{-1}}$ over a distance of 20 cm. What is the acceleration?
7. In the summer, a stone takes 2.2 s to fall from the top to the bottom of an empty well. In the winter, the stone takes 0.8 s to enter the water. How deep was the water in the well on the second occasion?
8. A helicopter ascends at a constant speed of $10\,\mathrm{m\,s^{-1}}$ and drops an object which takes 5 s to hit the ground. What was
   (a) the speed of the object as it hits the ground,
   (b) the height of the helicopter when the object was dropped?
9. A sprinter in a 100 m race accelerates uniformly for the first 6 s reaching a speed of $14.4\,\mathrm{m\,s^{-1}}$. If she maintains this speed for the rest of the race, in what time did she complete the race?
10. A lunar landing module is descending to the moon's surface at a steady speed of $10\,\mathrm{m\,s^{-1}}$. At a height of 120 m, a small object falls from the craft. Taking the acceleration due to gravity on the moon as $1.6\,\mathrm{m\,s^{-2}}$, at what speed does the object strike the moon?