

Physics 10154 - Exam #2A

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. Car A is driving East from downtown Fort Worth down I-30 with an average speed of 72 miles/hour. Car B is driving West from downtown Dallas along I-30 with an average speed of 66 miles/hour. The two cars begin 36 miles apart.

The Ballpark in Arlington is 16 miles East of downtown Fort Worth. How far to the East or West of the Ballpark will the cars pass one another? You may answer in miles with 2 Significant Figures.

$$\text{Total distance} = 36 \text{ miles}$$

From A's perspective, B is moving $66 + 72 = 138 \text{ mi/hr}$

$$\text{So } t = \frac{36}{138} = 0.261 \text{ hr}$$

$$\Delta x_A = (72)(0.261) = 18.8 \text{ miles}$$

So A ends up

2.8 miles	E of ballpark
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$$\Delta x_B = (66)(0.261) = 17.2 \text{ miles}$$

also 2.8 miles E of ballpark

2. A ball is dropped from an unknown height. An observer notices that it takes 1.35 seconds to fall the last 32.0 meters before hitting the ground. From what initial height above the ground was the ball dropped?

Last 32 m

$$\Delta y = 32$$

$$v_{0y} = ?$$

$$v_y = ?$$

$$a_y = 9.8$$

$$t = 1.35$$

$$32 = v_{0y}(1.35) + 4.9(1.35)^2$$

$$v_{0y} = \frac{32 - 8.93}{1.35} = 17.1 \text{ m/s}$$

1st part

$$\Delta y = ?$$

$$v_{0y} = 0$$

$$v_y = 17.1 \text{ m/s}$$

$$a_y = 9.8 \text{ m/s}^2$$

$$t = ?$$

$$17.1^2 = 0^2 + 2(9.8)\Delta y$$

$$\Delta y = \frac{17.1^2}{19.6} = 14.9 \text{ m}$$

$$\Delta y_{\text{tot}} = 32.0 + 14.9$$

$$= \boxed{46.9 \text{ m}}$$