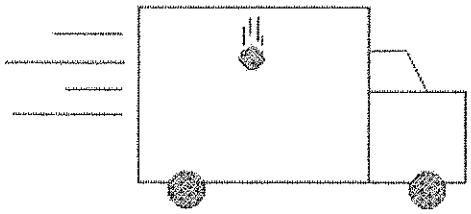
Unit 2 Review Questions: Mixed Problem Sets



__185. A truck is moving at constant speed. Inside the storage compartment, a rock is dropped from the midpoint of the ceiling and strikes the floor below. The rock hits the floor

a. ahead of the midpoint of the ceiling.
b. exactly below the midpoint of the ceiling.
c. behind the midpoint of the ceiling.
d. More information is needed to answer the question.

186. The following data is for a ball rolling down a constant-slope incline which has a frictionless surface:

v_i	v_f	v_{avg}	d	a	t
0			1.5		1
			6		2
			13.5		3

(A) Find the average speed for the ball during the four seconds.

(B) What is the final speed of the ball at the 4.0-second mark?

(C) What is the acceleration rate of the ball?

(D) Find the average speed of the ball during the time interval between 1.0 and 3.0 seconds.

(E) Find the actual speed (v_f) of the ball at the 2.0-second mark.

(F) What will be the actual speed of the ball at the 6.0-second mark? (assume the incline continues)

(G) At what position will the ball be at the 6.0-second mark?

(H) What is the rate of acceleration at the 7.0-second mark?

187. If a cat with a speed of 3 meters per second accelerates at $1m/s^2$, what is the speed of the cat after 2 seconds?

188. If a rock falls freely from rest, what is the speed of the rock after 4 seconds?

189. If a marble is launched upward with a velocity of 30 m/s, what is the speed of the rock after 2 seconds?

190. If dart is launched with an initial velocity of 30 m/s at an angle of 45^0, what is vertical velocity after 2 seconds?

191. If a dart is launched with an initial velocity of 30 m/s at an angle of 45^0, what is the horizontal velocity after3 seconds?

192 A piece of trash falls from a plane moving horizontally at 50 m/s. What is the vertical acceleration of the trash after 15 seconds?

193 What is the time of flight for a rock fired at an angle of 30^0, with an initial velocity of 20 m/s?

194. A dolphin with an initial horizontal velocity of 18 m/s launches at an angle of 20^0, what is the horizontal acceleration of the dolphin?

195. What is the time of flight for a rock fired straight upward from a slingshot with a velocity of 15 m/s?

196. A gull that lives by the sea flies with a horizontal speed of 5 m/s. He drops a shell which lands after 5 seconds. What is the horizontal velocity of the shell after 5 seconds?

197. A fox jumps upward to a height of 0.8 meters. What is the velocity of the fox at the top of the jump?

198. A frog jumps with a velocity of 2 meters per second at an angle of 60^0 to the horizontal. What is the final vertical velocity of the frog?

199. A dog toy falls from a cliff 75 m tall. What is the time of flight for the toy?

200. A robotic rover on a planet drops a sphere from a height of .75 m. The sphere lands 1 second later. What is the acceleration due to gravity on the planet?

201. A spring launched toy reaches a height of 1.3m. What is the launch velocity of the toy?

191. A paint ball launched at an angle is in the air for 10 seconds and travels a horizontal distance of 300m. What is initial velocity including (launch angle) of the paint ball?

202. A rocket reaches a height of 45m and has a horizontal range of 120 m. What is the launch velocity of the toy (include launch angle)? (Find the vertical and horizontal velocity of the toy)

203. What is the initial vertical velocity of bowling ball dropped from a hot air balloon from a height of 500m?

204. After launch a stomp rocket takes 7 seconds to land. What is the maximum vertical height of the rocket? What is the horizontal range of the rocket? What is the launch velocity of the rocket?

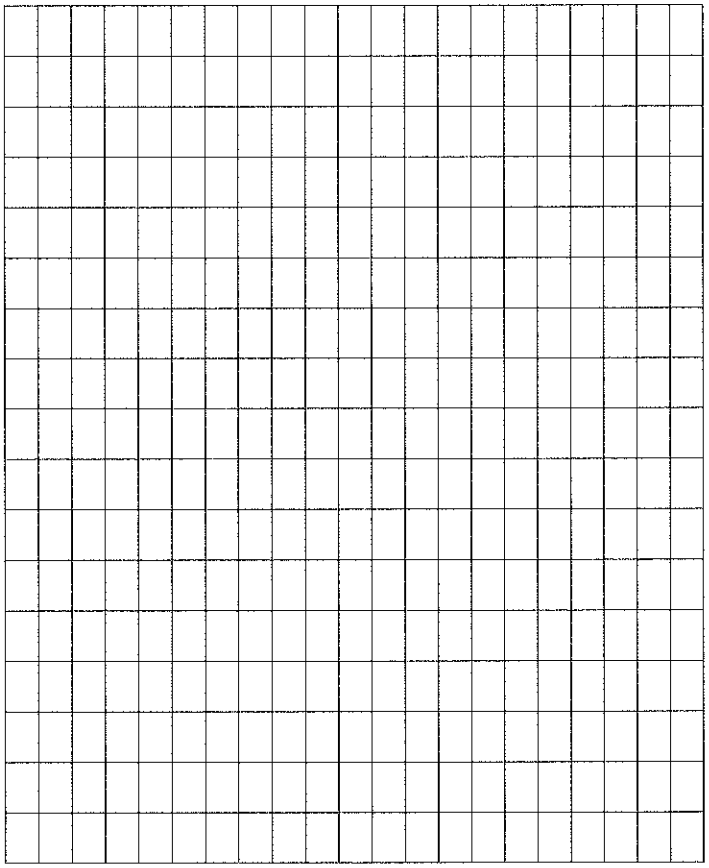
205 An object moving east with a velocity of 4 m/s east experiences and acceleration of 2 m/s^2 west for 3 seconds. What is the final velocity of the object?

206. Road Runner is travelling at 60 m/s east when he experiences an acceleration of 30 m/s^2 west. How much time will it take for Road Runner to come to rest? What is his resultant displacement during this time frame? [Topic 2A]

207. Road runner has the following motion as he runs away from the Wile Coyote.

- Accelerates uniformly from rest to 20m/s in 3 seconds
- Moves at a constant speed of 20 m/s for the next 3 seconds
- Accelerates from that point at a rate of 4 m/s^2 for 4 seconds.

a) Represent this motion on the velocity versus time grid below



b) What is the distance traveled by the Roadrunner in the first 3 seconds?

c) What is the acceleration during the 0-3 seconds?

d) What is the distance covered by the Roadrunner in the next 3 seconds?

e) What is the change in velocity during the final four seconds?

f) What is the distance covered during the final four seconds?

g) What is the total distance covered during the 10 seconds of motion?

h) What feature on the graph helps you find the distance covered?

208. A rock is thrown horizontally from the top of a cliff 98 m high, with a horizontal speed of 27 m/s.
(a) For what interval of time is the rock in the air?

(b) How far from the base of the cliff does the rock land?

(c) With what velocity does the rock hit?

209. A rescue pilot wishes to drop a package of emergency supplies so that it lands as close as possible to a target. If the plane travels with a velocity of 81 m/s and is flying 125 m above the target, how far away (horizontally) from the target must the rescue pilot drop the package?

210. A bullet is fired with a horizontal velocity of 330 m/s from a height of 1.6 m above ground. Assuming the ground is level how far from the gun will the bullet hit the ground?

211. A fireman standing on top of a building 20.0 m high sprays water horizontally from a hose at 12 m/s, the water hits a burning wall of an adjacent building at a height of 15.0 m above the ground. What is the horizontal distance from the fireman to the building?

212. An earth bound golfer strikes a golf ball giving it a velocity of 48 m/s at an angle of 50° to the horizontal.
(a) What are the vertical and horizontal components of the ball's initial velocity?

(b) How long is the ball in the air?

(c) What is the horizontal distance covered by the ball while in flight?

(d) What velocity does the ball have at the top of its trajectory?

213. A golf ball was struck from the first tee at Lunar Golf and Country Club. It was given a velocity of 48 m/s at an angle of 40° to the horizontal. On the moon, $a_{gravity} = -1.6\ m/s^2$
(a) What are the vertical and horizontal components of the ball's initial velocity?

(b) For what interval of time is the ball in flight?

(c) How far will the ball travel horizontally?

214. An archer standing on the back of a pickup truck moving at 28 m/s fires an arrow straight up at a duck flying directly overhead. The archer misses the duck! The arrow was fired with an initial velocity of 49 m/s relative to the truck.
(a) For how long will the arrow be in the air?

(b) How far will the truck travel while the arrow is in the air?

(c) Where, in relation to the "duckless" archer, will the arrow come down? Will the archer have to 'duck'?

215. A ball is thrown with a velocity of 24 m/s at an angle of 30° to the horizontal.
(a) What are the vertical and horizontal components of the initial velocity?

(b) How long is the ball in the air?

(c) How far away will the ball land?

(d) To what maximum height will the ball rise?

(e) With what velocity will the ball land?

216. A fish jumps out of a fishbowl located on a shelf with a speed of 5 m/s at an angle of 30°. If the fish lands 0.5 seconds later, how high was the water in fish bowl from level ground. (CHALLENGE PROBLEM)

217. A youngster hits a baseball giving it a velocity of 22 m/s at an angle of 62° with the horizontal. How far will the ball travel before it is caught by a fielder (assuming the fielder catches the ball at the same height that it is hit)?

218. On level ground, a football is thrown up at a certain angle. The ball is in the air 2.0 s and strikes the ground 30.0 m (range) from the thrower. What was the ball's initial velocity?

219. A pebble is fired from a slingshot with a velocity of 30 m/s. It is fired at an angle of 30° to the horizontal. If its flight is interrupted by a wall located 12 m in front, at what height does it hit the wall? (CHALLENGE PROBLEM)

220. A diver takes off with a speed of 8.0 m/s from a 3.0 m high diving board at 30° above the horizontal. How much later does she strike the water? (CHALLENGE PROBLEM)

221. A pilot cuts loose two fuel tanks in an effort to gain altitude. At the time of release, the plane was 120 m above the ground and traveling upward at 30° to the horizontal, with a speed of 84 m/s. For how long did the tanks fall and with what speed did they hit the ground?