Projectiles Worksheet
Draw all vectors to scale on your own paper

Vector drawings to scale

1. Draw vectors that represent the following displacements:
   Use the scale 1 cm = 5 km and ↑ north
   a. 25 km east
   b. 15 km west
   c. 105 km south
   d. 75 km north
   e. 45 km northwest

2. Draw vectors that represent the following velocities:
   Use the scale 1 cm = 4 m/s and ↑ north
   a. 32 m/s east
   b. 54 m/s west
   c. 26 m/s south
   d. 44 m/s north
   e. 20 m/s southeast

3. Draw vectors that represent the following displacements:
   Use your own different scale for each.
   a. 450 ft east
   b. 28 mi west
   c. 220 km south
   d. 1,500 cm north

4. Draw vectors that represent the following velocities:
   Use your own scale, use the same scale for each.
   a. 35 mi/h east
   b. 55 mi/h west
   c. 75 mi/h south
   d. 100 mi/h north

5. Draw vector combinations to determine the resultant vector for the following combinations: Use the scale 1 cm = 1 m and ↑ north.
   a. 7 m north; 4 m north
   b. 8 m south; 3 m north
   c. 3 m east; 6 m east
   d. 10 m west; 4 m east
   e. 2 m north; 5 m south
   f. 3 m west; 7 m east

6. Draw vector combinations to determine the resultant vector for the following combinations: Use the scale 1 cm = 1 m and ↑ north.
   a. 7 m north; 4 m west
   b. 8 m south; 3 m east
   c. 3 m east; 6 m north
   d. 10 m west; 4 m south
   e. 2 m east; 5 m south
   f. 3 m west; 7 m north

7. Draw vector combinations to determine the resultant vector for the following combinations: Use the scale 1 cm = 2 m and ↑ north.
   a. 8 m north; 4 m west; 6 m south; 12 m west
   b. 8 m south; 2 m east; 16 m south; 20 m west
   c. 12 m east; 6 m north; 12 m west; 6 m south
   d. 10 m west; 4 m south; 21 m east; 14 m north

Projectiles Worksheet

Draw all vectors to scale on your own paper

Vector problems

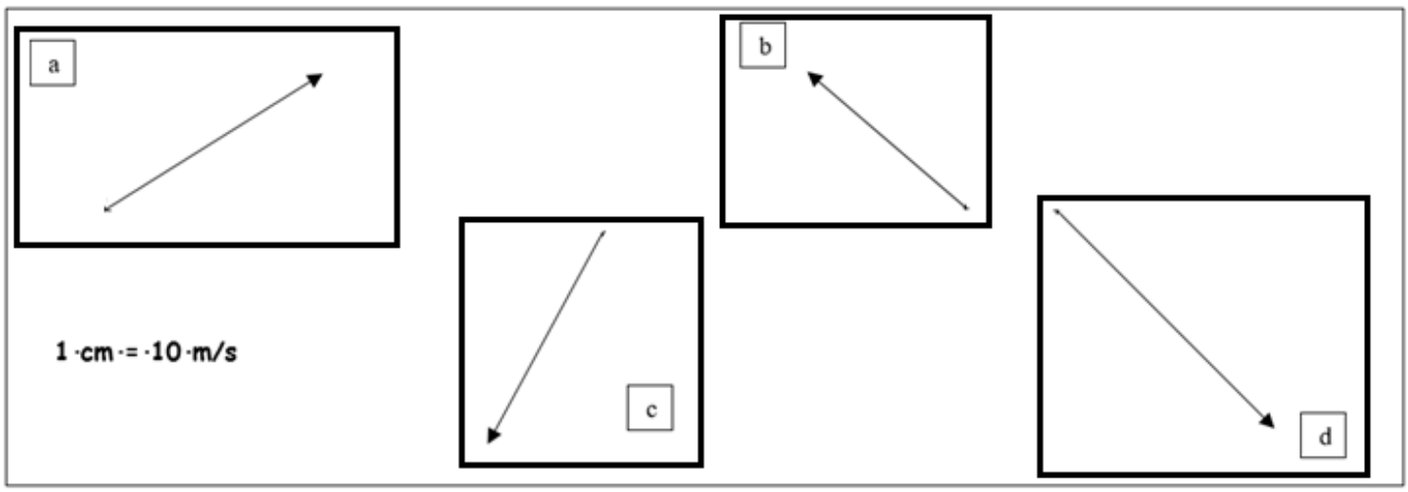
8. A motor boat heads due west at 10 m/s across a river. The river flows due south at 6 m/s. Find the resultant velocity of the boat as observed by a person on the river bank.

11.7 m/s SW

9. A plane flies north at 180 mi/h across a river while encountering a crosswind blowing 45 mi/h to the west. Find the resultant velocity of the plane as observed by a person on the ground below. *185.5 mi/h*

Vector components

10. Draw the horizontal and vertical components of each vector. Label the magnitude of each vector and component based on the scale provided.



Projectiles

11. Provide 5 examples of projectiles (we are still treating air as negligible). Be sure to describe what the object is doing that makes it a projectile…don't just write "a baseball".
12. Describe the horizontal motion of a projectile.
13. Describe the vertical motion of a projectile.
14. What is the shape of the trajectory of a projectile?
15. A toy train runs off a tabletop, which is 1.4 meters high. If the train is moving at 5.0 m/s, how far from the base of the table will the train land? *2.7 m*
16. A moon craft is moving at 90 m/s while 3,000 m above the moon's surface. (a) What is the initial vertical velocity of a rover that is dropped from the craft? (b) How much time will it take the rover to hit the ground? (c) How far will the rover travel horizontally after being dropped? (d) Where will the rover be relative to the craft at the point of impact?

$g_{moon} = 1.62\ m/s^2$ *0 60.9 s 5,481 km*

17. A tennis ball is dropped from 1m above the ground at the same time as a tennis ball that is hit horizontally from 1 m above the ground. Explain why both tennis balls will strike the ground at the same time.
18. A baseball thrown into the air with an angle of 35° above the ground and travels 100 ft. What other angle could the baseball be thrown at and travel the same distance? Explain your answer. (The initial speed is the same for each baseball.)
19. Explain how/why the moon is a projectile?

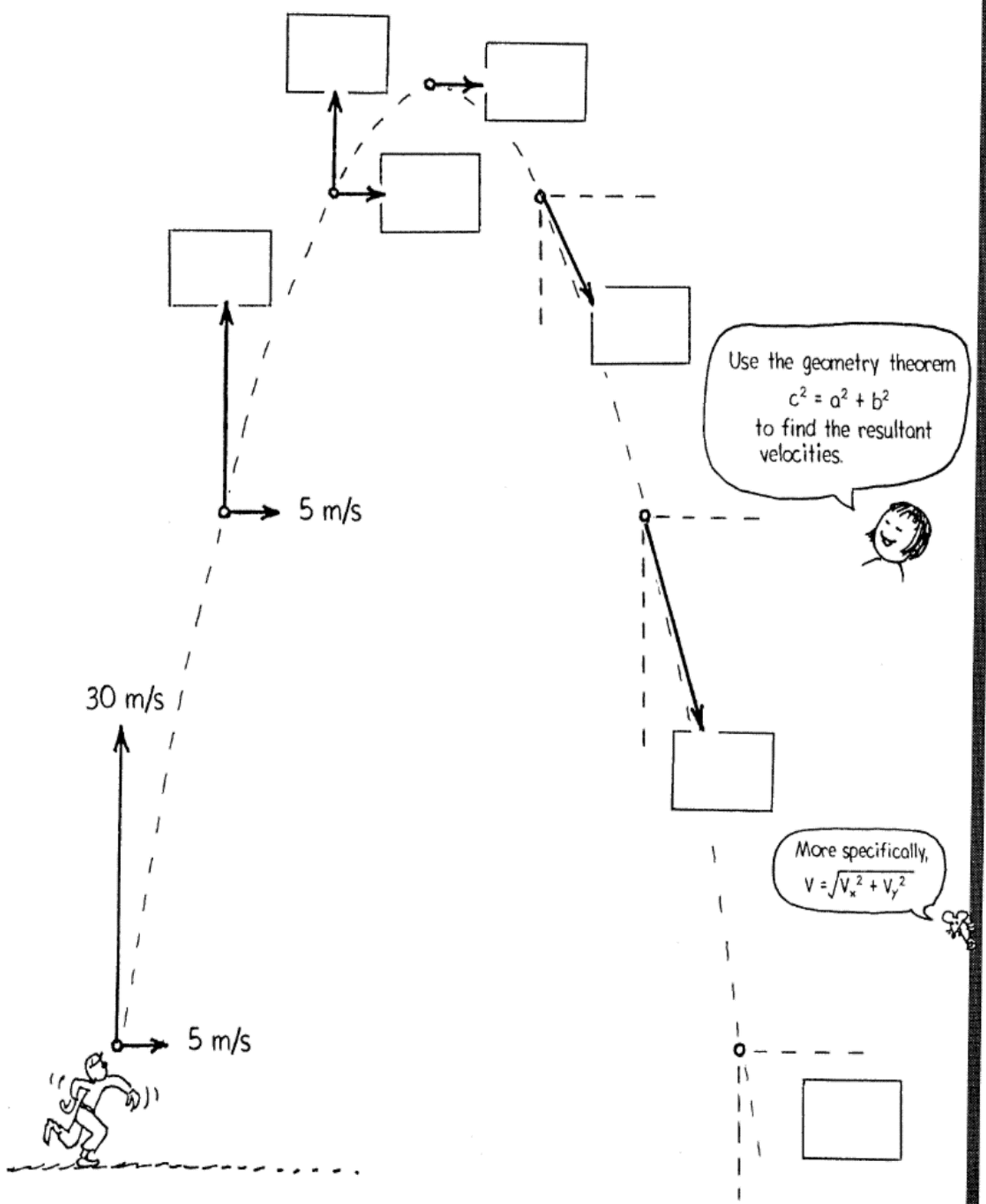
Projectiles Worksheet

Draw all vectors to scale on your own paper

20.

Tossed Ball

A ball tossed upward has initial velocity components 30 m/s vertical, and 5 m/s horizontal. The position of the ball is shown at 1-second intervals. Air resistance is negligible, and $g = 10\ m/s^2$. Fill in the boxes, writing in the values of velocity ***components*** ascending, and your calculated ***resultant velocities*** descending.



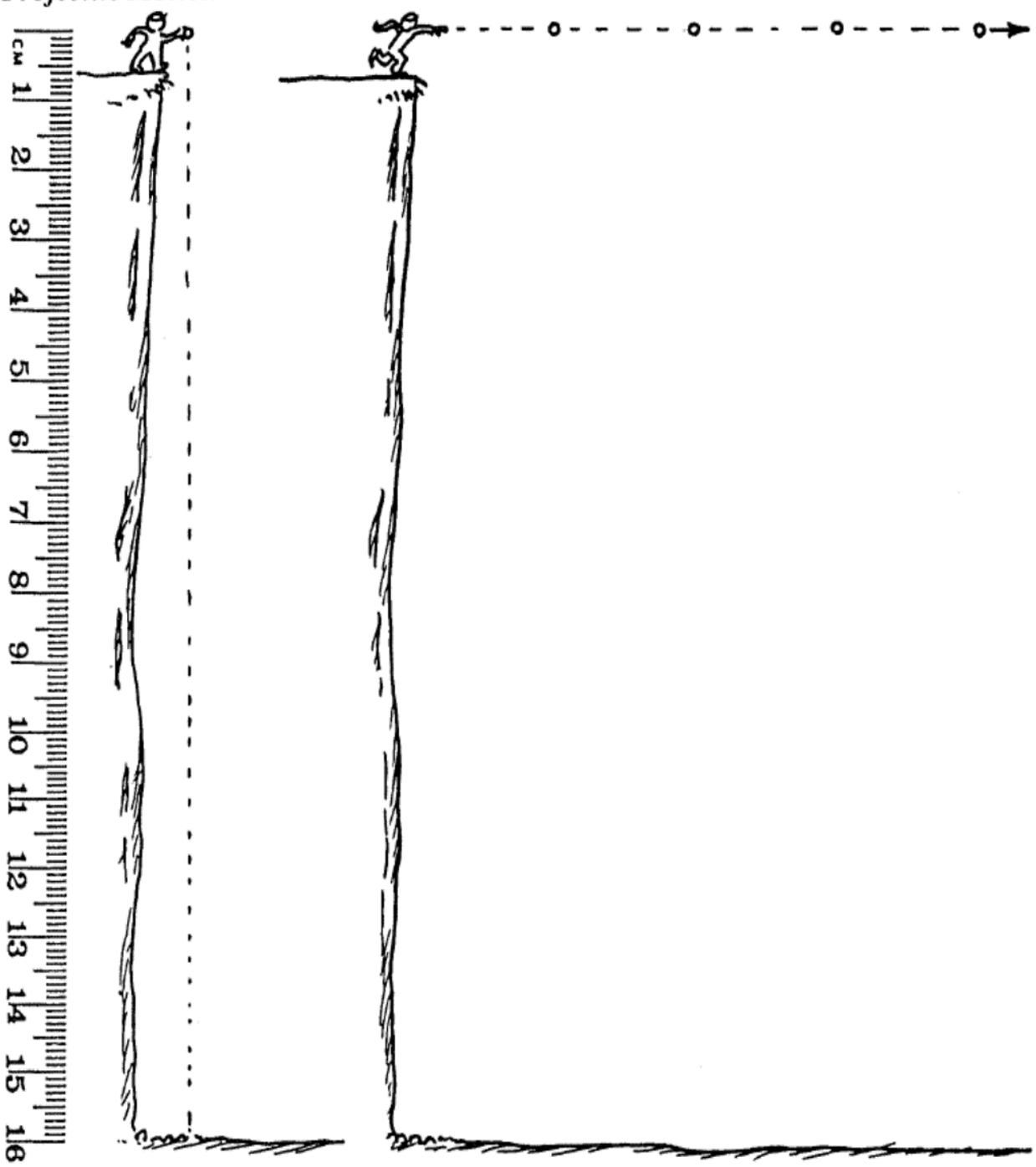
Conceptual PHYSICS

Projectiles Worksheet

Draw all vectors to scale on your own paper

Concept-Development Practice Page **3-1**

Projectile Motion



21. Above left: Use the scale 1 cm: 5 m and draw the positions of the dropped ball at 1-second intervals. Neglect air drag and assume $g = 10\ m/s^2$. Estimate the number of seconds the ball is in the air.

_____ seconds.

22. Above right: The four positions of the thrown ball with *no gravity* are at 1-second intervals. At 1 cm: 5 m, carefully draw the positions of the ball *with* gravity. Neglect air drag and assume $g = 10\ m/s^2$. Connect your positions with a smooth curve to show the path of the ball. How is the motion in the vertical direction affected by motion in the horizontal direction?

_____

Conceptual PHYSICS