


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

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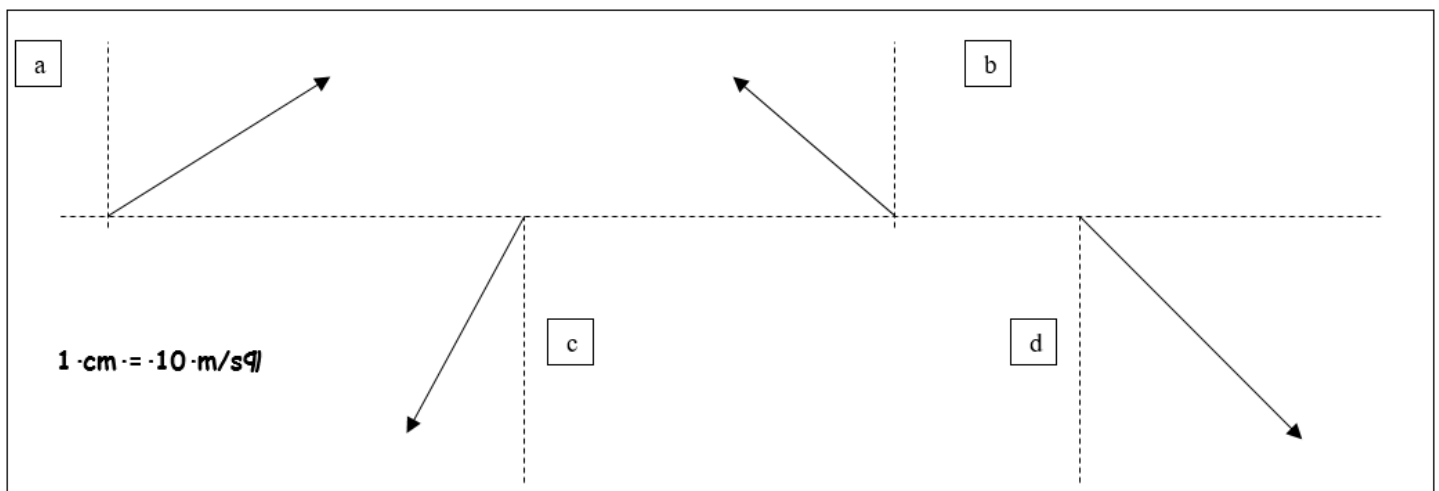
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Vector problems

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.
 - If the river is 200 m wide, how long does it take the boat to cross the river?
 - How far downstream is the boat when it reaches the other side?
- 11.7 m/s SW 20 s 60 m*
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.
 - If the plane continues with this constant motion for 2 hours, what is the plane's total distance travelled?
- 185.5 mi/h 371 mi*

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 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?
- $g_{\text{moon}} = 1.62 \text{ m/s}^2$ 0 61 s 5.58 km*
16. 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.)
17. Explain how/why the moon is a projectile?

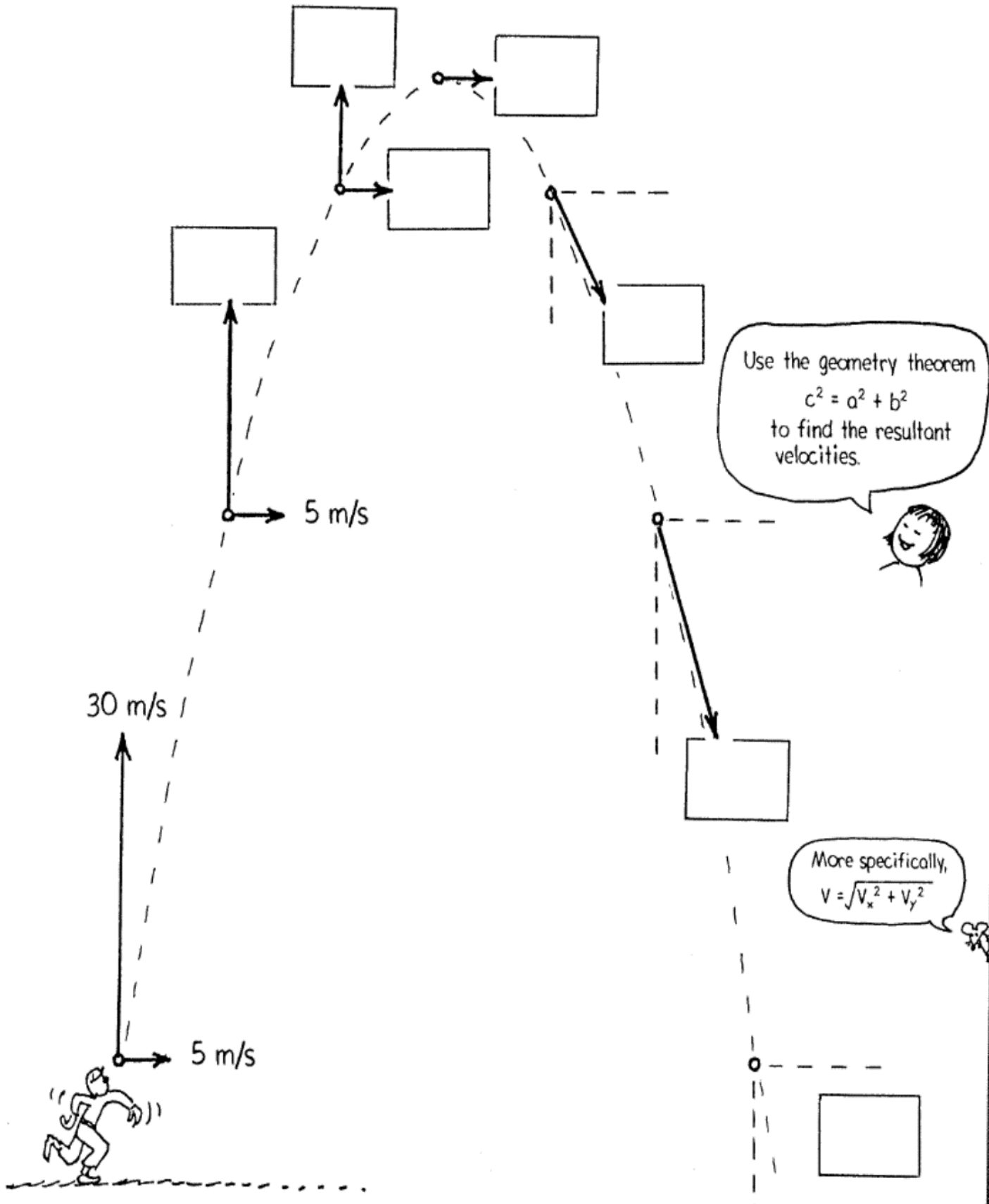
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18.

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 $g = 10 \text{ m/s}^2$. Fill in the boxes, writing in the values of velocity *components* ascending, and your calculated *resultant velocities* descending.



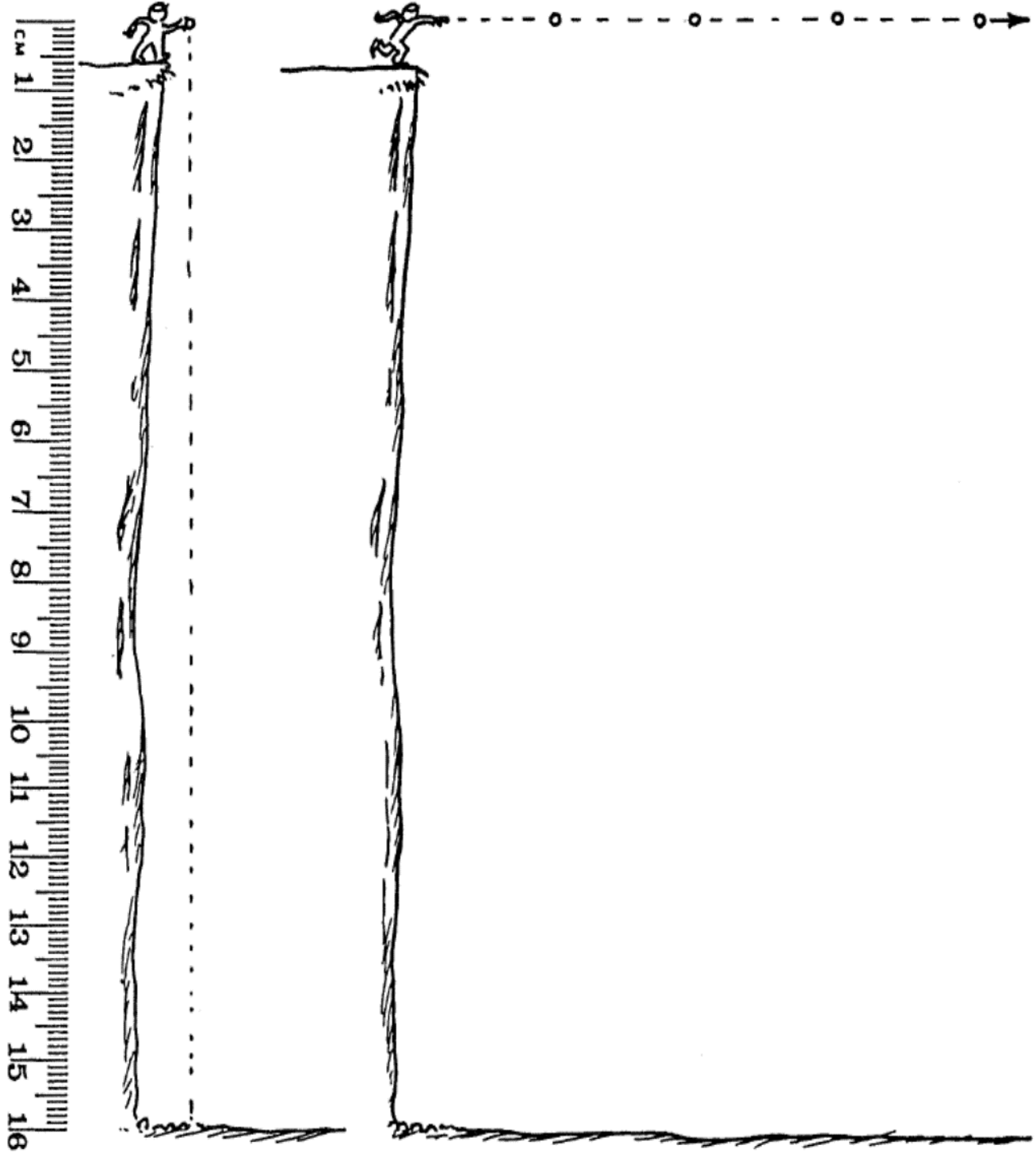
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Concept-Development Practice Page

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Projectile Motion



19. 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 $g = 10 \text{ m/s}^2$. Estimate the number of seconds the ball is in the air.
- _____ seconds.
20. 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 $g = 10 \text{ m/s}^2$. 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?
- _____