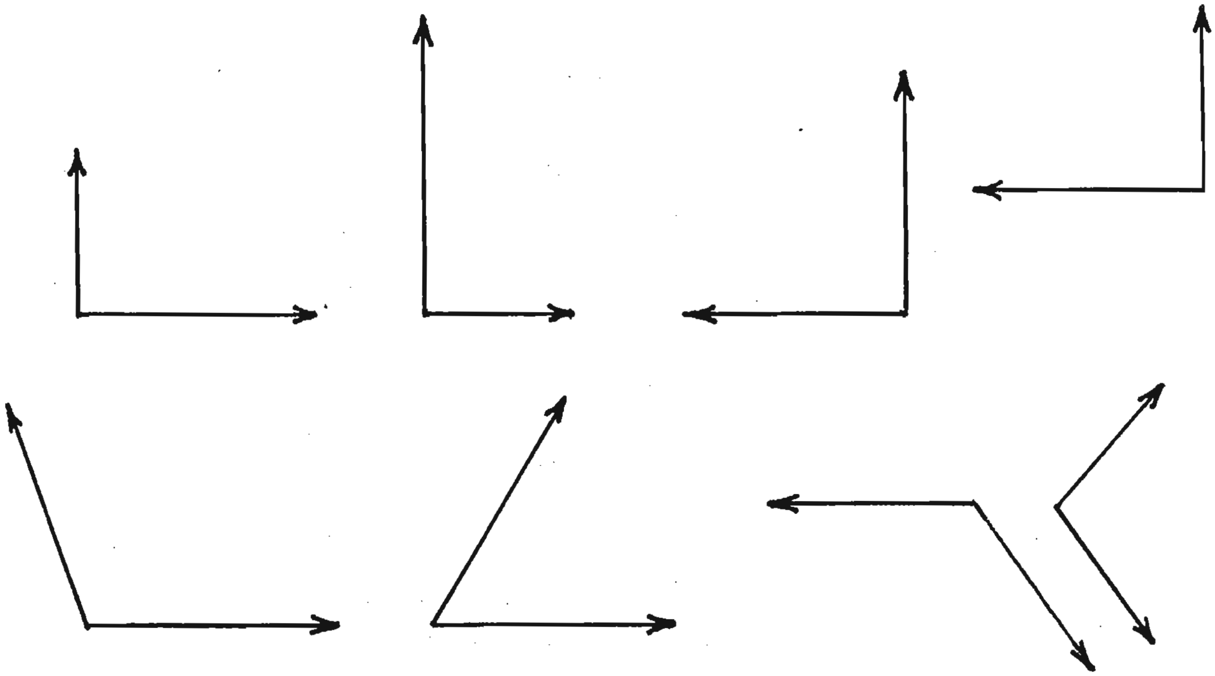
Name Period Date

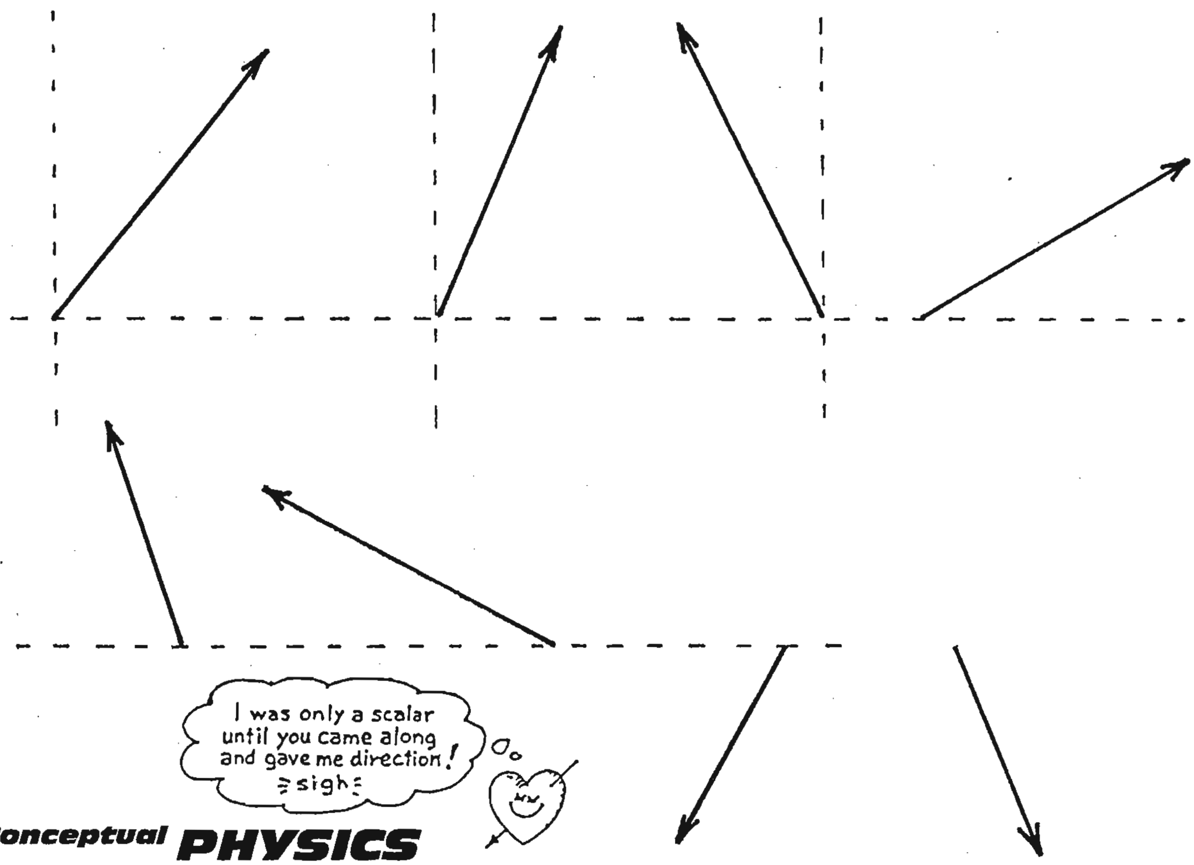
Concept-Development Practice Page 3-2

Vectors

Use the parallelogram rule to carefully construct the resultants for the eight pairs of vectors.



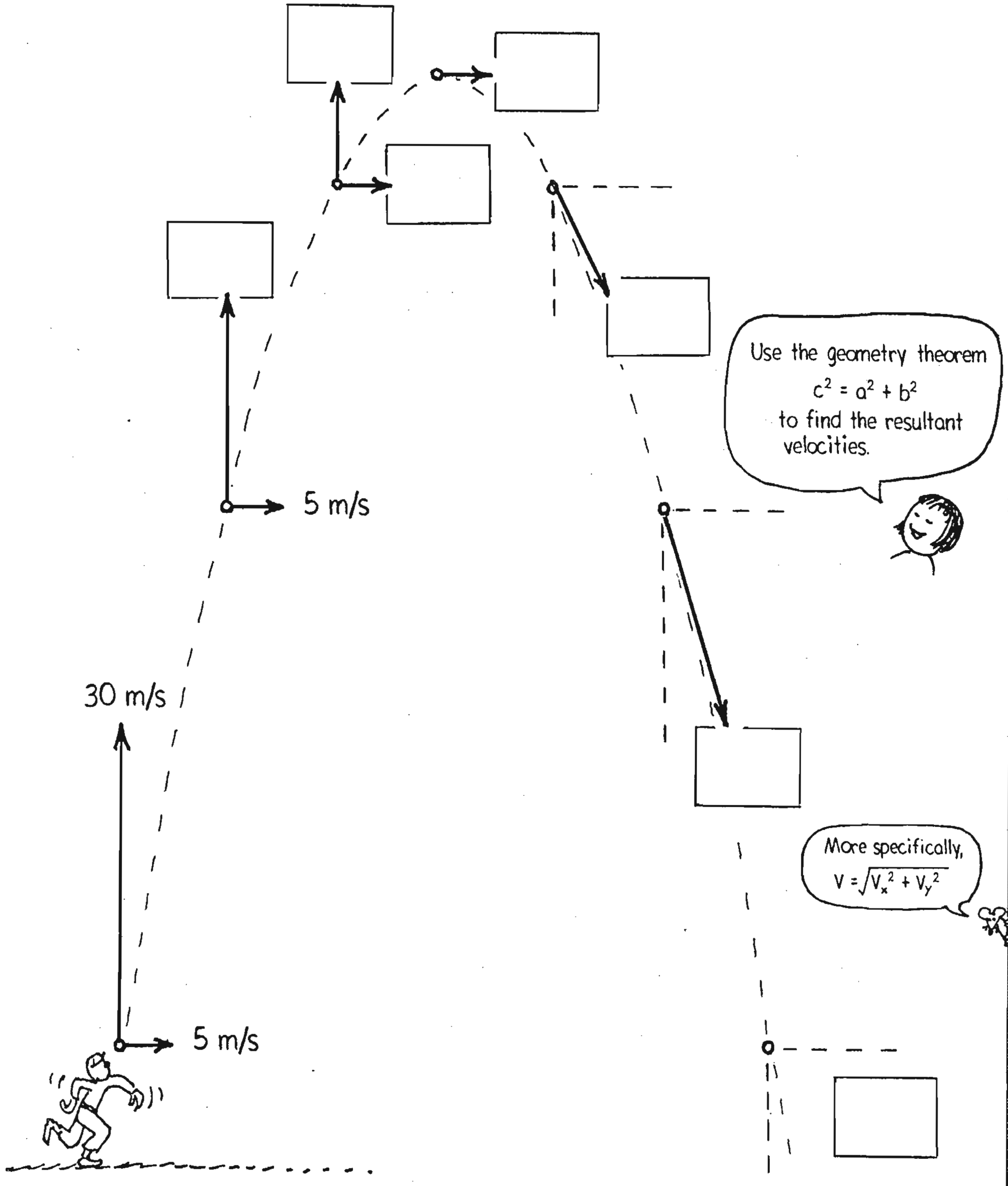
Carefully construct the vertical and horizontal components of the eight vectors.



Conceptual PHYSICS

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.



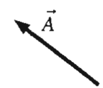
Conceptual PHYSICS

3 Vectors and Motion in Two Dimensions

3.1 Using Vectors

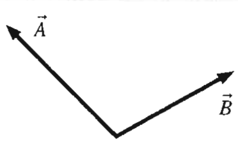
1. Use a figure and the properties of vector addition to show that vector addition is associative. That is, show that
$(\vec{A}+\vec{B})+\vec{C}=\vec{A}+(\vec{B}+\vec{C})$

2. Draw and label the vector $2\vec{A}$ and the vector $\frac{1}{2}\vec{A}$.



Exercises 3–5: Draw and label the vector difference $\vec{A}-\vec{B}$.

3.



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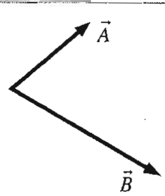

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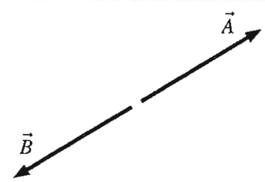
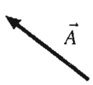
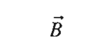


6. Given vectors $\vec{A}$ and $\vec{B}$ below, find the vector $\vec{C}=2\vec{A}-3\vec{B}$.



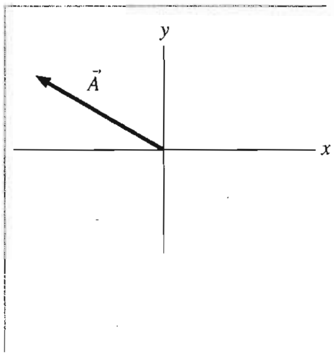


3.3 Coordinate Systems and Vector Components

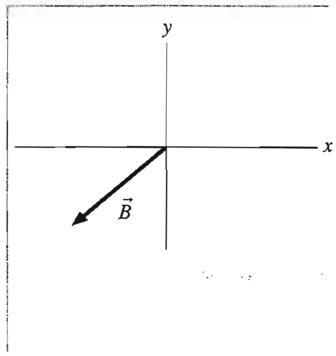
3.4 Motion on a Ramp

Exercises 11–13: Draw and label the x- and y-component vectors of the vector shown.

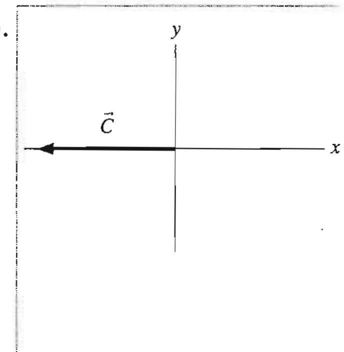
11.



12.

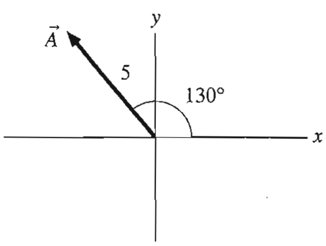


13.

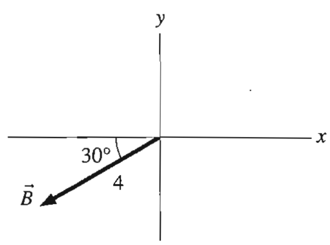


Exercises 14–16: Determine the numerical values of the x- and y-components of each vector.

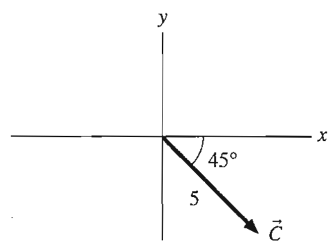
14.



15.



16.



$A_x =$ ______ $B_x =$ ______ $C_x =$ ______

$A_y =$ ______ $B_y =$ ______ $C_y =$ ______

17. What is the vector sum $\vec{D} = \vec{A} + \vec{B} + \vec{C}$ of the three vectors defined in Exercises 14–16?

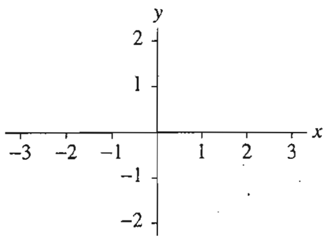
$D_x =$ ______ $D_y =$ ______

18. Can a vector have a component equal to zero and still have nonzero magnitude? Explain.

19. Can a vector have zero magnitude if one of its components is nonzero? Explain.

Exercises 20–22: For each vector:
- Draw the vector on the axes provided.
- Draw and label an angle θ to describe the direction of the vector.
- Find the magnitude and the angle of the vector.

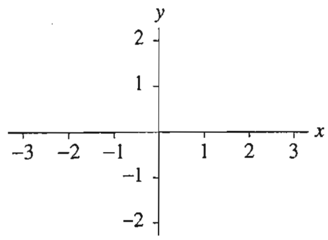
20. $A_x = 3,\ A_y = -2$



A = ____________

θ = ____________

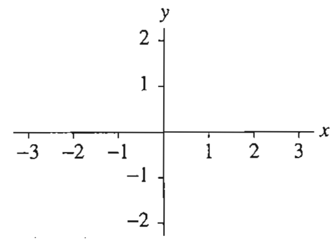
21. $B_x = -2,\ B_y = 2$



B = ____________

θ = ____________

22. $C_x = 0,\ C_y = -2$

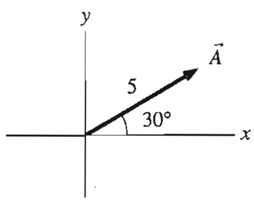


C = ____________

θ = ____________

Exercises 23–25: Define vector $\vec{A}$ = (5, 30° above the horizontal). Determine the components A_x and A_y in the three coordinate systems shown below. Show your work below the figure.

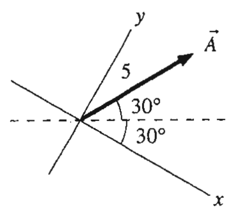
23.



A_x = ____________

A_y = ____________

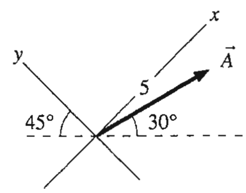
24.



A_x = ____________

A_y = ____________

25.



A_x = ____________

A_y = ____________

26. The figure shows a ramp and a ball that rolls along the ramp. Draw vector arrows on the figure to show the ball's acceleration at each of the lettered points A to E (or write $\vec{a} = \vec{0}$, if appropriate).