Chapter Assessment
Section 1 Vectors: Mastering Problems

55. **Cars** A car moves 65 km due east then 45 km due west. What is its total displacement? (Level 1)
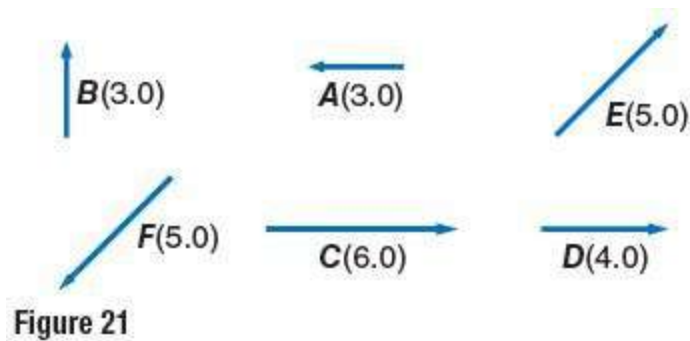
SOLUTION:

$65 \text{ km} + (-45 \text{ km}) = 2.0 \times 10^1 \text{ km}$

$\Delta d = 2.0 \times 10^1$ km, east

ANSWER:

$\Delta d = 2.0 \times 10^1$ km, east

B(3.0) A(3.0) E(5.0)

F(5.0) C(6.0) D(4.0)

Figure 21

56. Find the horizontal and vertical components of the following vectors shown in **Figure 21.** In all cases assume that up and right are positive directions. (Level 1)

    a. E
    b. F
    c. A

SOLUTION:
a.

$$E_x = E \cos \theta$$
$$= (5.0)(\cos 45°)$$
$$= 3.5$$
$$E_y = E \sin \theta$$
$$= (5.0)(\sin 45°)$$
$$= 3.5$$

b.

$$F_x = F \cos \theta$$
$$= (5.0)(\cos 225°)$$
$$= -3.5$$
$$F_y = F \sin \theta$$
$$= (5.0)(\sin 225°)$$
$$= -3.5$$

c.

$$A_x = A \cos \theta$$
$$= (3.0)(\cos 180°)$$
$$= -3.0$$
$$A_y = A \sin \theta$$
$$= (3.0)(\sin 180°)$$
$$= 0.0$$

ANSWER:
a.

$$E_x = 3.5 \qquad E_y = 3.5$$

b.

$$F_x = -3.5 \qquad F_y = -3.5$$
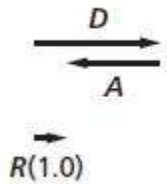
c.

$$A_x = -3.0 \qquad A_y = 0.0$$

57. Graphically find the sum of the following pairs of vectors, shown in **Figure 21.** (Level 1)

    a. D and A
    b. C and D
    c. C and A
    d. E and F

SOLUTION:

a.

D
A
R(1.0)

b.

C   D
R(10.0)

c.

C
A
R(3.0)

d.

E
F
R(0.0)

ANSWER:

a.
R(1.0)

b.
R(10.0)

c.
R(3.0)

d.
R(0.0)

58. Graphically add the following sets of vectors shown in **Figure 21.** (Level 2)

    a. *A, C,* and *D*
    b. *A, B,* and *E*
    c. *B, D,* and *F*

    SOLUTION:
    a.

    b.

    c.

    ANSWER:
    a.

    b.

    c.
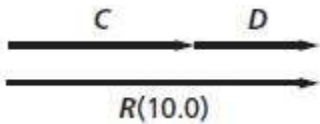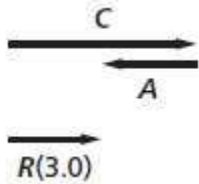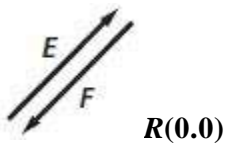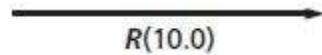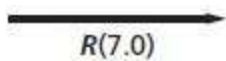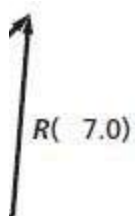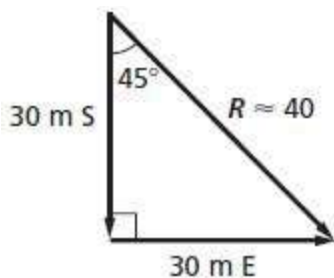
Chapter 5 Practice Problems, Review, and Assessment

60. You walk 30 m south and 30 m east. Find the magnitude and direction of the resultant displacement both graphically and algebraically. (Level 2)

SOLUTION:

$$R^2 = A^2 + B^2$$
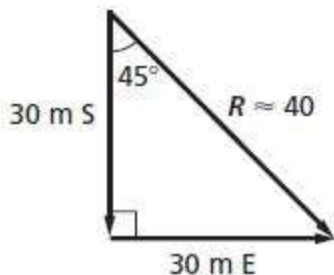
$$R = \sqrt{(30\text{ m})^2 + (30\text{ m})^2}$$

$$= 40\text{ m}$$

$$\tan\theta = \frac{30\text{ m}}{30\text{ m}} = 1$$

$$\theta = 45°$$

$R = 40$ m, 45° east of south

ANSWER:

$$R^2 = A^2 + B^2$$

$$R = \sqrt{(30\text{ m})^2 + (30\text{ m})^2}$$

$$= 40\text{ m}$$

$$\tan\theta = \frac{30\text{ m}}{30\text{ m}} = 1$$

$$\theta = 45°$$

$R = 40$ m, 45° east of south

Chapter Assessment: Applying Concepts

89. A vector that is 1 cm long represents a displacement of 5 km. How many kilometers are represented by a 3-cm vector drawn to the same scale?

SOLUTION:

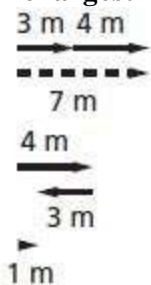$$(3 \text{ cm}) \left(\frac{5 \text{ km}}{1 \text{ cm}} \right) = 15 \text{ km}$$

ANSWER:

$$(3 \text{ cm}) \left(\frac{5 \text{ km}}{1 \text{ cm}} \right) = 15 \text{ km}$$

91. What is the largest possible net displacement resulting from two displacements with magnitudes 3 m and 4 m? What is the smallest possible resultant? Draw sketches to demonstrate your answers.

SOLUTION:

The largest is 7 m; the smallest is 1 m.

ANSWER:

The largest is 7 m; the smallest is 1 m.