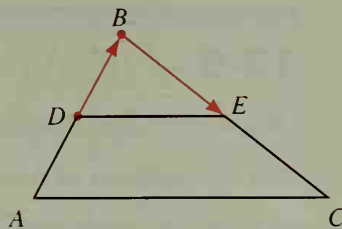


33. a. Given: $\overrightarrow{AB} = 2\overrightarrow{DB}$ and $\overrightarrow{BC} = 2\overrightarrow{BE}$

Supply the reasons for each step.

1. $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$
2. $= 2\overrightarrow{DB} + 2\overrightarrow{BE}$
3. $= 2(\overrightarrow{DB} + \overrightarrow{BE})$ (Hint: See Exercise 32.)
4. $= 2\overrightarrow{DE}$

- b. What theorem about midpoints does part (a) prove?



34. Suppose two nonvertical vectors (a, b) and (c, d) are perpendicular.

- a. Use slopes to show that $\frac{bd}{ac} = -1$.
- b. Show that $ac + bd = 0$.
- c. The number $ac + bd$ is called the **dot product** of vectors (a, b) and (c, d) . Complete: If (a, b) and (c, d) are perpendicular vectors, then their dot product ?.
- d. Verify the statement in part (c) for the vectors in Example 2(b) on page 540 and in Exercise 18 on page 542.

Mixed Review Exercises

1. On a number line, point A has coordinate -11 and B has coordinate 7 . Find the coordinate of the midpoint of \overline{AB} .
2. If M is the midpoint of the hypotenuse \overline{AB} of right triangle ABC , and $AM = 6$, find MB and MC .
3. The lengths of the bases of a trapezoid are 12 and 20 . Find the length of the median.
4. If the length of one side of an equilateral triangle is $2a$, find the length of an altitude.
5. Find the measure of each interior angle of a regular hexagon.
6. Each side of a regular hexagon $ABCDEF$ has length x . Find AD and AC .
7. Find the measure of each exterior angle of a regular octagon.
8. Find the coordinates of the fourth vertex of a rectangle that has three vertices at $(-3, -2)$, $(2, -2)$, and $(2, 5)$.
9. The vertices of quad. $ABCD$ are $A(2, 0)$, $B(7, 0)$, $C(7, 5)$, and $D(2, 5)$. Find the area of quad. $ABCD$.
10. The vertices of $\triangle PQR$ are $P(0, 0)$, $Q(-6, 0)$, and $R(-6, 6)$. Find the area of $\triangle PQR$.
11. $\triangle DEF$ has vertices $D(-5, 1)$, $E(-2, -3)$, and $F(6, 3)$.
 - a. Use the distance formula to show that $\triangle DEF$ is a right triangle.
 - b. Use slopes to show that $\triangle DEF$ is a right triangle.
12. $\triangle ABC$ has vertices $A(6, 0)$, $B(4, 8)$, and $C(2, 6)$.
 - a. Find the slope of the altitude from B to \overline{AC} .
 - b. Find the slope of the perpendicular bisector of \overline{AB} .