1. What is the result of adding the vectors $\langle 8,5\rangle$ and $\langle 2,8\rangle$?

A. $\langle 10,13\rangle$
B. $\langle 10,64\rangle$
C. $\langle 10,40\rangle$
D. $\langle 40,16\rangle$
E. $\langle 64,10\rangle$

2. The component forms of vectors $\boldsymbol{u}$ and $\boldsymbol{v}$ are given by $\boldsymbol{u}=\langle 6,3\rangle$ and $\boldsymbol{v}=\langle 4,-1\rangle$. Given that $\boldsymbol{u}-2\boldsymbol{v}+\boldsymbol{w}=0$, what is the component form of $\boldsymbol{w}$?

A. $\langle -2,5\rangle$
B. $\langle 2,-5\rangle$
C. $\langle -2,-5\rangle$
D. $\langle 2,5\rangle$
E. $\langle 4,-10\rangle$

3. What vector is in the same direction as $\langle 9,-12\rangle$ with a length of 1 ?

A. $\langle 8,-11\rangle$
B. $\left\langle 1,-\frac{12}{9}\right\rangle$
C. $\left\langle \frac{3}{5},-\frac{4}{5}\right\rangle$
D. $\left\langle \frac{3}{5},\frac{4}{5}\right\rangle$
E. $\left\langle \frac{3}{4},1\right\rangle$

4. What is the magnitude of the vector formed from the addition of $\langle 4,6\rangle$ and $\langle -3,9\rangle$?

A. $\langle 1,15\rangle$
B. $2\sqrt{13}+3\sqrt{10}$
C. $2\sqrt{13}-3\sqrt{10}$
D. $\sqrt{226}$
E. 15

5. If $\overrightarrow{V_1}=(-3,7)$ and $\overrightarrow{V_2}=(11,4)$, then what is $\left\langle 2\overrightarrow{V_1}+\overrightarrow{V_2}\right\rangle$?

A. $\sqrt{349}$
B. 26.94
C. $\langle 5,18\rangle$
D. $\langle 5,11\rangle$
E. $\left\langle \frac{5\sqrt{349}}{349},\frac{18\sqrt{349}}{349}\right\rangle$

6. If $|\vec{m}|=23$ and $|\vec{n}|=20$, which of the following could NOT be $\langle m+n\rangle$?

A. 43
B. 40
C. 15
D. 3
E. 2

7. If vectors $\vec{t}=\langle 3,-4\rangle$ and $\vec{u}=\langle 8,8\rangle$, then $\langle \vec{t}-\vec{u}\rangle=?$

A. $\langle 11,4\rangle$
B. $\langle -5,-4\rangle$
C. $\langle 5,12\rangle$
D. -6.31
E. 16.31

8. A vector perpendicular to vector $\vec{V}=\langle 2,-5\rangle$ is:

A. $\langle -5,2\rangle$
B. $\langle -2,5\rangle$
C. $\left\langle -\frac{1}{2},\frac{1}{5}\right\rangle$
D. $\langle 5,-2\rangle$
E. $\langle 5,2\rangle$

9. If $\vec{a} = \langle 4,-1 \rangle$ and $\vec{b} = \langle 5,-7 \rangle$, what is the magnitude of $\vec{a}+\vec{b}$?

A. $\langle 9,-8 \rangle$

B. $\langle -1,6 \rangle$

C. $-\sqrt{145}$

D. $\sqrt{145}$

E. $\sqrt{17}$

10. If $\overrightarrow{V_1} = 3\boldsymbol{i} + 2\boldsymbol{j}$ and $\overrightarrow{V_2} = 2\boldsymbol{i} - \boldsymbol{j}$, the resultant vector of $3\overrightarrow{V_1} - \overrightarrow{V_2}$ equals:

A. $\langle 3\boldsymbol{i}+2\boldsymbol{j}, 2\boldsymbol{i}-\boldsymbol{j} \rangle$

A. $11\boldsymbol{i}+5\boldsymbol{j}$

A. $7\boldsymbol{i}+7\boldsymbol{j}$

A. $5\boldsymbol{i}+\boldsymbol{j}$

A. $7\sqrt{2}$

ANSWER

1. A **2. B.** **3. C** **4. D** **5. C** **6. E** **7. C** **8. E** **9. C** **10. D**

ANSWER EXPLANATIONS

1. **A.** To add vectors, simply add the corresponding parts of the vector. So, $\langle 8,5\rangle+\langle 2,8\rangle=\langle(8+2),(5+8)\rangle=\langle 10,13\rangle$.

2. **B.** Setting up the equation as the relationship between the corresponding parts of the vector gives us $\boldsymbol{u}_1-2\boldsymbol{v}_1+\boldsymbol{w}_1=0$ and $\boldsymbol{u}_2-2\boldsymbol{v}_2+\boldsymbol{w}_2=0$. Plugging in gives us $6-2(4)+\boldsymbol{w}_1=0$ and $3-2(-1)+\boldsymbol{w}_2=0$. Manipulating the equations gives us $\boldsymbol{w}_1=2$ and $\boldsymbol{w}_2=-5$. Thus, $\boldsymbol{w}$'s component form is $\langle 2,-5\rangle$.

3. **C.** We can find the vector with equal direction but a magnitude of 1 by dividing the entire vector by its current magnitude. We are essentially scaling down the triangle formed when we add the vectors down to a smaller triangle with a hypotenuse of 1. The current magnitude of the triangle is $\sqrt{9^2+(-12)^2}=\sqrt{81+144}=\sqrt{225}=15$. We divide the vector by $15: \dfrac{\langle 9,-12\rangle}{15}=\left\langle \dfrac{9}{15},-\dfrac{12}{15}\right\rangle=\left\langle \dfrac{3}{5},-\dfrac{4}{5}\right\rangle$.

4. **D.** First we add the vectors: $\langle 4,6\rangle+\langle -3,9\rangle=\langle 4-3,6+9\rangle=\langle 1,15\rangle$. We now find the magnitude of this vector: $\sqrt{1^2+15^2}=\sqrt{1+225}=\sqrt{226}$.

5. **C.** First, plug the vectors into the equation in component form: $\left|2\langle -3,7\rangle+\langle 11,4\rangle\right|$. The scalar multiplier, 2, doubles the values of both components of the first vector: $\left|\langle -6,14\rangle+\langle 11,4\rangle\right|=\left|\langle 5,18\rangle\right|=\langle 5,18\rangle$

6. **E.** It is easier to solve this problem by thinking about them as the legs of a triangle. We know from geometry that 2 legs of a triangle must have a sum greater than or equal to the remaining leg. The only answer that contradicts this property is E. If the third leg of the triangle had a length of 2, then it and the leg of length 20 couldn't reach as far as the leg of length 23 even if they were lying flat against it.

7. **C.** Plug the vectors into the equation in component form: $\left|\langle 3,-4\rangle-\langle 8,8\rangle\right|=\left|\langle 3-8,-4-8\rangle\right|=\left|\langle -5,-12\rangle\right|=\langle 5,12\rangle$

8. **E.** A perpendicular vector will have a slope of the negative reciprocal of the original vector's slope. The original vector's slope is its x component divided by its y component: $\dfrac{2}{-5}$. So the slope of the answer will be $\dfrac{5}{2}$. The x component of this slope is 5 and the y component is 2, so one vector with this slope will be $\langle 5,2\rangle$.

9. **D.** The magnitude of $\vec{a}+\vec{b}$ is the magnitude of $\langle 4,-1\rangle+\langle 5,-7\rangle$, which is $\langle 4+5,-1-7\rangle=\langle 9,-8\rangle$. We find the magnitude using the Pythagorean theorem: $\sqrt{9^2+(-8)^2}=\sqrt{81+64}=\sqrt{145}$.

10. **C.** $3\overrightarrow{V_1}-\overrightarrow{V_2}=3(3i+2j)-(2i-j)=9i+6j-2i+j=7i+7j$.