MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If all the components of a vector are equal to 1, then that vector is a unit vector.
   A) True  
   B) False  

2) The magnitude of a vector can never be less than the magnitude of one of its components.
   A) True  
   B) False  

3) If a woman weighs 125 lb, her mass expressed in kilograms is \( x \) kg, where \( x \) is
   A) greater than 125.  
   B) less than 125.  

4) The current definition of the standard second of time is based on
   A) the frequency of radiation emitted by cesium atoms.  
   B) the oscillation of a particular pendulum kept in France.  
   C) the duration of one year.  
   D) the earth's rotation rate.  

5) The current definition of the standard meter of length is based on
   A) the length of a particular object kept in France.  
   B) the distance traveled by light in a vacuum.  
   C) the distance between the earth's equator and north pole.  
   D) the distance between the earth and the sun.  

6) A teacher sends her students on a treasure hunt. She gives the following instructions:
   1. Walk 300 m north
   2. Walk 400 m northwest
   3. Walk 700 m east–southeast and the treasure is buried there.
   As all the other students walk off following the instructions, Jane physics student quickly adds the
   displacements and walks in a straight line to find the treasure. How far and in what direction does
   Jane need to walk?
   A) 284 m in a direction 28.2° west of north  
   B) 481 m in a direction 40.9° north of east  
   C) 187 m in a direction 67.3° north of east  
   D) 399 m in a direction 52.5° north of east  
   E) The treasure position cannot be reached in one straight walk.  

7) The wavelength of a certain laser is 0.35 micrometers, where 1 micrometer = \( 1 \times 10^{-6} \) m. Express
   this wavelength in nanometers.
   A) \( 3.5 \times 10^2 \) nm  
   B) \( 3.5 \times 10^3 \) nm  
   C) \( 3.5 \times 10^4 \) nm  
   D) \( 3.5 \times 10^1 \) nm  

8) What is the result of \( 1.58 \div 3.793 \) written with the correct number of significant figures?
   A) \( 4.1656 \times 10^{-1} \)  
   B) \( 4 \times 10^{-1} \)  
   C) \( 4.166 \times 10^{-1} \)  
   D) \( 4.17 \times 10^{-1} \)  
   E) \( 4.2 \times 10^{-1} \)
9) The exhaust fan on a typical kitchen stove pulls 600 CFM (cubic feet per minute) through the filter. Given that 1.00 in. = 2.54 cm, how many cubic meters per second does this fan pull?
   A) 32.8 m$^3$/sec  
   B) 0.328 m$^3$/sec  
   C) 0.283 m$^3$/sec  
   D) 3.05 m$^3$/sec

10) What is the sum of 1123 and 10.3 written with the correct number of significant figures?
   A) 1133.3  
   B) $1.1 \times 10^3$  
   C) $1.13 \times 10^3$  
   D) 1133.3000  
   E) 1133
Answer Key
Testname: HOMEWORK1-A

1) B
2) A
3) B
4) A
5) B
6) B
7) A
8) D
9) C
10) E
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Under what condition is $|\vec{A} - \vec{B}| = A + B$?  
   A) Vectors $\vec{A}$ and $\vec{B}$ are in opposite directions.  
   B) Vectors $\vec{A}$ and $\vec{B}$ are in the same direction.  
   C) The magnitude of vector $\vec{B}$ is zero.  
   D) Vectors $\vec{A}$ and $\vec{B}$ are in perpendicular directions.  
   E) The statement is never true.

2) If the eastward component of vector $\vec{A}$ is equal to the westward component of vector $\vec{B}$ and their northward components are equal. Which one of the following statements about these two vectors is correct?  
   A) The magnitude of vector $\vec{A}$ is equal to the magnitude of vector $\vec{B}$.  
   B) Vector $\vec{A}$ is parallel to vector $\vec{B}$.  
   C) Vectors $\vec{A}$ and $\vec{B}$ point in opposite directions.  
   D) Vector $\vec{A}$ is perpendicular to vector $\vec{B}$.  
   E) The magnitude of vector $\vec{A}$ is twice the magnitude of vector $\vec{B}$.

3) If $\vec{A} - \vec{B} = 0$, then the vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes and are directed in the opposite directions from each other.  
   A) True  
   B) False

4) If a tree is 15 m tall, its height expressed in feet is $x$ ft, where $x$ is  
   A) greater than 15.  
   B) less than 15.

5) If all the components of a vector are equal to 1, then that vector is a unit vector.  
   A) True  
   B) False

6) What is the vector product of $\vec{A} = 2.00 \hat{i} + 3.00 \hat{j} + 1.00 \hat{k}$ and $\vec{B} = 1.00 \hat{i} - 3.00 \hat{j} - 2.00 \hat{k}$?  
   A) $2.00 \hat{i} - 9.00 \hat{j} - 2.00 \hat{k}$  
   B) $-4.00 \hat{i} + 3.00 \hat{j} - 1.00 \hat{k}$  
   C) $-3.00 \hat{i} + 5.00 \hat{j} - 9.00 \hat{k}$  
   D) $-5.00 \hat{i} + 2.00 \hat{j} - 6.00 \hat{k}$  
   E) $-9.00 \hat{i} - 3.00 \hat{j} - 3.00 \hat{k}$
7) As shown in the figure, three force vectors act on an object. The magnitudes of the forces as shown in the figure are $F_1 = 80.0$ N, $F_2 = 60.0$ N, and $F_3 = 40.0$ N, where N is the standard SI unit of force. The resultant force acting on the object is given by

A) 40.0 N at an angle 60.0° with respect to $+x$-axis.
B) 180 N at an angle 60.0° with respect to $+x$-axis.
C) 20.0 N at an angle 34.3° with respect to $+x$-axis.
D) 60.0 N at an angle 90.0° with respect to $+x$-axis.
E) 35.5 N at an angle 34.3° with respect to $+x$-axis.

8) In addition to $1 \text{ m} = 39.37 \text{ in.}$, the following exact conversion equivalents are given: $1 \text{ mile} = 5280 \text{ ft}$, $1 \text{ ft} = 12 \text{ in}$, $1 \text{ hour} = 60 \text{ min}$, and $1 \text{ min} = 60 \text{ s}$. If a particle has a velocity of 8.4 miles per hour, its velocity, in m/s, is closest to

A) 3.4 m/s.  
B) 3.8 m/s.  
C) 4.1 m/s.  
D) 4.5 m/s.  
E) 3.0 m/s.

9) The wavelength of a certain laser is 0.35 micrometers, where 1 micrometer $= 1 \times 10^{-6}$ m. Express this wavelength in nanometers.

A) $3.5 \times 10^4 \text{ nm}$  
B) $3.5 \times 10^1 \text{ nm}$  
C) $3.5 \times 10^2 \text{ nm}$  
D) $3.5 \times 10^3 \text{ nm}$

10) For the vectors shown in the figure, find the magnitude and direction of $\vec{B} \times \vec{A}$, assuming that the quantities shown are accurate to two significant figures.

A) 26, directed into the plane
B) 31, directed into the plane
C) 26, directed out of the plane
D) 31, directed on the plane
E) 31, directed out of the plane
Answer Key
Testname: HOMEWORK1-B

1) A
2) A
3) B
4) A
5) B
6) C
7) E
8) B
9) C
10) A
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The magnitude of a vector can never be less than the magnitude of one of its components.
   A) True  B) False

2) If a woman weighs 125 lb, her mass expressed in kilograms is $x$ kg, where $x$ is
   A) less than 125.  B) greater than 125.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

3) For the vectors shown in the figure, express vector $\vec{S}$ in terms of vectors $\vec{M}$ and $\vec{N}$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

4) Which of the following is an accurate statement?
   A) The magnitude of a vector can be zero even though one of its components is not zero
   B) The magnitude of a vector is independent of the coordinate system used.
   C) Even though two vectors have unequal magnitudes, it is possible that their vector sum is zero.
   D) Rotating a vector about an axis passing through the tip of the vector does not change the vector.
   E) It is possible to add a scalar quantity to a vector.

5) If two vectors are perpendicular to each other, their cross product must be zero.
   A) True  B) False

6) What is the sum of 1123 and 10.3 written with the correct number of significant figures?
   A) $1.13 \times 10^3$  B) 1133  C) $1.1 \times 10^3$  D) 1133.3  E) 1133.3000

7) You walk 53 m to the north, then turn 60° to your right and walk another 45 m. Determine the direction of your displacement vector. Express your answer as an angle relative to east.
   A) 63° N of E  B) 69° N of E  C) 50° N of E  D) 57° N of E
8) The angle between vector \( \vec{A} = 2.00\hat{i} + 3.00\hat{j} \) and vector \( \vec{B} \) is 45.0°. The scalar product of vectors \( \vec{A} \) and \( \vec{B} \) is 3.00. If the x component of vector \( \vec{B} \) is positive, what is vector \( \vec{B} \)?

A) \( 2.96\hat{i} + 0.973\hat{j} \)
B) \( 3.42\hat{i} + 0.684\hat{j} \)
C) \( 0.871\hat{i} + 0.419\hat{j} \)
D) \( 1.15\hat{i} + 0.231\hat{j} \)
E) \( 4.76\hat{i} + 0.952\hat{j} \)

9) If \( \vec{C} = -4\hat{i} - 2\hat{j} - 3\hat{k} \), what is \( \vec{C} \times \hat{j} \)?

A) \( +3\hat{i} + 2\hat{j} - 4\hat{k} \)
B) \( +3\hat{i} + 4\hat{k} \)
C) \( +3\hat{i} - 4\hat{k} \)
D) \( -3\hat{i} - 2\hat{j} + 4\hat{k} \)
E) \( -3\hat{i} + 4\hat{k} \)

10) As shown in the figure, three force vectors act on an object. The magnitudes of the forces as shown in the figure are \( F_1 = 80.0 \text{ N} \), \( F_2 = 60.0 \text{ N} \), and \( F_3 = 40.0 \text{ N} \), where N is the standard SI unit of force. The resultant force acting on the object is given by

A) \( 60.0 \text{ N} \) at an angle 90.0° with respect to \(+x\)-axis.
B) \( 35.5 \text{ N} \) at an angle 34.3° with respect to \(+x\)-axis.
C) \( 20.0 \text{ N} \) at an angle 34.3° with respect to \(+x\)-axis.
D) \( 180 \text{ N} \) at an angle 60.0° with respect to \(+x\)-axis.
E) \( 40.0 \text{ N} \) at an angle 60.0° with respect to \(+x\)-axis.
Answer Key
Testname: HOMEWORK1-C

1) A
2) A
3) \( \vec{S} = \vec{M} - \vec{N} \)
4) B
5) B
6) B
7) A
8) D
9) C
10) B
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If all the components of a vector are equal to 1, then that vector is a unit vector.  
   A) True  B) False

2) Under what condition is $|\vec{A} - \vec{B}| = A + B$?  
   A) Vectors $\vec{A}$ and $\vec{B}$ are in opposite directions.  
   B) Vectors $\vec{A}$ and $\vec{B}$ are in perpendicular directions.  
   C) Vectors $\vec{A}$ and $\vec{B}$ are in the same direction.  
   D) The magnitude of vector $\vec{B}$ is zero.  
   E) The statement is never true.

3) The current definition of the standard meter of length is based on  
   A) the distance between the earth’s equator and north pole.  
   B) the length of a particular object kept in France.  
   C) the distance traveled by light in a vacuum.  
   D) the distance between the earth and the sun.

4) If a tree is 15 m tall, its height expressed in feet is $x$ ft, where $x$ is  
   A) greater than 15.  B) less than 15.

5) If two vectors are perpendicular to each other, their cross product must be zero.  
   A) True  B) False

6) The components of vector $\vec{B}$ are $B_x = -3.5$ and $B_y = -9.7$, and the components of vector $\vec{C}$ are $C_x = -6$ and $C_y = +8.1$. What is the angle (less than 180 degrees) between vectors $\vec{B}$ and $\vec{C}$?  
   A) 163°  B) 106°  C) 56°  D) 124°  E) 17°

7) Vector $\vec{A} = -3.00 \hat{i} + 3.00 \hat{j}$ and vector $\vec{B} = 3.00 \hat{i} + 4.00 \hat{j}$. What is vector $\vec{C} = \vec{A} + \vec{B}$?  
   A) $-3.00 \hat{i} - 3.00 \hat{j}$  
   B) $0.00 \hat{i} + 3.00 \hat{j}$  
   C) $7.00 \hat{i} + 7.00 \hat{j}$  
   D) $0.00 \hat{i} + 7.00 \hat{j}$  
   E) $-3.00 \hat{i} + 7.00 \hat{j}$
8) The length and width of a rectangle are 1.125 m and 0.606 m, respectively. Multiplying, your calculator gives the product as 0.68175. Rounding properly to the correct number of significant figures, the area should be written as
   A) 0.7 m².
   B) 0.68 m².
   C) 0.682 m².
   D) 0.6818 m².
   E) 0.68175 m².

9) Convert 1.2 \times 10^{-3} to decimal notation.
   A) 1.200
   B) 0.1200
   C) 0.0120
   D) 0.0012
   E) 0.00012

10) Vectors \vec{A} and \vec{B} are shown in the figure. What is \left| -5.00 \vec{A} + 4.00 \vec{B} \right|?
   A) 34.0
   B) -32.0 \hat{i} - 2.00 \hat{j}
   C) -2.00 \hat{i} - 32.0 \hat{j}
   D) 31.8
   E) 1028
Answer Key
Testname: HOMEWORK1-D

1) B
2) A
3) C
4) A
5) B
6) D
7) D
8) C
9) D
10) D
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If a tree is 15 m tall, its height expressed in feet is \( x \) ft, where \( x \) is
   A) less than 15.                          B) greater than 15.  

2) If two vectors are perpendicular to each other, their cross product must be zero.
   A) True                                B) False  

3) When determining the number of significant figures in a number, zeroes to the left of the decimal point are never counted.
   A) True                                B) False  

4) The current definition of the standard second of time is based on
   A) the earth’s rotation rate.           B) the oscillation of a particular pendulum kept in France.
   C) the duration of one year.            D) the frequency of radiation emitted by cesium atoms.

5) When adding two numbers, the number of significant figures in the sum is equal to the number of significant figures in the least accurate of the numbers being added.
   A) True                                B) False  

6) If \( \vec{C} = -4\hat{i} - 2\hat{j} - 3\hat{k} \), what is \( \vec{C} \times \hat{j} \)?
   A) +3\hat{i} + 4\hat{k}                  B) -3\hat{i} + 4\hat{k}  
   C) +3\hat{i} - 4\hat{k}                  D) -3\hat{i} - 2\hat{j} + 4\hat{k}  
   E) +3\hat{i} + 2\hat{j} - 4\hat{k}  

7) What is the product of 11.24 and 1.95 written with the correct number of significant figures?
   A) 22  B) 21.9  C) 21.92  D) 21.918  E) 21.9180  

8) The scalar product of vector \( \vec{A} = 3.00\hat{i} + 2.00\hat{j} \) and vector \( \vec{B} \) is 10.0. Which of the following vectors could be vector \( \vec{B} \)?
   A) 4.00\hat{i} + 6.00\hat{j}  
   B) 2.00\hat{i} + 2.00\hat{j}  
   C) 5.00\hat{i} + 4.00\hat{j}  
   D) 2.00\hat{i} + 4.00\hat{j}  
   E) 12.0\hat{i}
9) The wavelength of a certain laser is 0.35 micrometers, where 1 micrometer = \(1 \times 10^{-6}\) m. Express this wavelength in nanometers.

A) \(3.5 \times 10^2\) nm  
B) \(3.5 \times 10^3\) nm  
C) \(3.5 \times 10^4\) nm  
D) \(3.5 \times 10^1\) nm

10) The angle between vector \(\vec{A} = 2.00\hat{i} + 3.00\hat{j}\) and vector \(\vec{B}\) is 45.0°. The scalar product of vectors \(\vec{A}\) and \(\vec{B}\) is 3.00. If the \(x\) component of vector \(\vec{B}\) is positive, what is vector \(\vec{B}\)?

A) \(3.42\hat{i} + 0.684\hat{j}\)  
B) \(4.76\hat{i} + 0.952\hat{j}\)  
C) \(2.96\hat{i} - 0.973\hat{j}\)  
D) \(0.871\hat{i} + 0.419\hat{j}\)  
E) \(1.15\hat{i} + 0.231\hat{j}\)
1) B
2) B
3) B
4) D
5) B
6) C
7) B
8) B
9) A
10) E
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If the eastward component of vector $\vec{A}$ is equal to the westward component of vector $\vec{B}$ and their northward components are equal. Which one of the following statements about these two vectors is correct?

A) The magnitude of vector $\vec{A}$ is twice the magnitude of vector $\vec{B}$.
B) Vector $\vec{A}$ is perpendicular to vector $\vec{B}$.
C) Vector $\vec{A}$ is parallel to vector $\vec{B}$.
D) Vectors $\vec{A}$ and $\vec{B}$ point in opposite directions.
E) The magnitude of vector $\vec{A}$ is equal to the magnitude of vector $\vec{B}$.

2) If the dot product of two nonzero vectors is zero, the vectors must be perpendicular to each other.

A) True
B) False

3) The value of the dot product of two vectors depends on the particular coordinate system being used.

A) True
B) False

4) If an operatic aria lasts for 5.75 min, its length expressed in seconds is $x$ s, where $x$ is

A) less than 5.75.
B) greater than 5.75.

5) The current definition of the standard kilogram of mass is based on

A) the mass of the earth.
B) the mass of the sun.
C) the mass of a cesium-133 atom.
D) the mass a particular object kept in France.
Answer Key
Testname: HOMEWORK1-F

1) E
2) A
3) B
4) B
5) D
GYTE FİZ121 Homework 1-G

Name______________________________

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

1) For the vectors shown in the figure, express vector \( \vec{S} \) in terms of vectors \( \vec{M} \) and \( \vec{N} \).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

2) The current definition of the standard meter of length is based on
   A) the distance traveled by light in a vacuum.
   B) the distance between the earth and the sun.
   C) the distance between the earth’s equator and north pole.
   D) the length of a particular object kept in France.

3) If a woman weighs 125 lb, her mass expressed in kilograms is \( x \) kg, where \( x \) is
   A) greater than 125.
   B) less than 125.

4) If a tree is 15 m tall, its height expressed in feet is \( x \) ft, where \( x \) is
   A) less than 15.
   B) greater than 15.

5) If the eastward component of vector \( \vec{A} \) is equal to the westward component of vector \( \vec{B} \) and their northward components are equal. Which one of the following statements about these two vectors is correct?
   A) The magnitude of vector \( \vec{A} \) is twice the magnitude of vector \( \vec{B} \).
   B) Vectors \( \vec{A} \) and \( \vec{B} \) point in opposite directions.
   C) Vector \( \vec{A} \) is perpendicular to vector \( \vec{B} \).
   D) The magnitude of vector \( \vec{A} \) is equal to the magnitude of vector \( \vec{B} \).
   E) Vector \( \vec{A} \) is parallel to vector \( \vec{B} \).

6) What is the result of \( 1.58 \div 3.793 \) written with the correct number of significant figures?
   A) \( 4.1656 \times 10^{-1} \)
   B) \( 4.2 \times 10^{-1} \)
   C) \( 4.166 \times 10^{-1} \)
   D) \( 4.17 \times 10^{-1} \)
   E) \( 4 \times 10^{-1} \)
7) The scalar product of vector \( \vec{A} = 3.00\hat{i} + 2.00\hat{j} \) and vector \( \vec{B} \) is 10.0. Which of the following vectors could be vector \( \vec{B} \)?

A) \( 5.00\hat{i} + 4.00\hat{j} \)
B) \( 2.00\hat{i} + 2.00\hat{j} \)
C) \( 12.0\hat{i} \)
D) \( 4.00\hat{i} + 6.00\hat{j} \)
E) \( 2.00\hat{i} + 4.00\hat{j} \)

8) 0.00325 \( \times \) 10\(^{-8} \) cm can also be expressed in mm as

A) \( 3.25 \times 10^{-12} \) mm.
B) \( 3.25 \times 10^{-11} \) mm.
C) \( 3.25 \times 10^{-10} \) mm.
D) \( 3.25 \times 10^{-9} \) mm.
E) \( 3.25 \times 10^{-8} \) mm.

9) What is the vector product of \( \vec{A} = 2.00\hat{i} + 3.00\hat{j} + 1.00\hat{k} \) and \( \vec{B} = 1.00\hat{i} - 3.00\hat{j} - 2.00\hat{k} \)?

A) \( -5.00\hat{i} + 2.00\hat{j} - 6.00\hat{k} \)
B) \( -9.00\hat{i} - 3.00\hat{j} - 3.00\hat{k} \)
C) \( 2.00\hat{i} - 9.00\hat{j} - 2.00\hat{k} \)
D) \( -4.00\hat{i} + 3.00\hat{j} - 1.00\hat{k} \)
E) \( -3.00\hat{i} + 5.00\hat{j} - 9.00\hat{k} \)

10) For the vectors shown in the figure, find the magnitude and direction of \( \vec{B} \times \vec{A} \), assuming that the quantities shown are accurate to two significant figures.

A) 31, directed out of the plane
B) 26, directed into the plane
C) 31, directed on the plane
D) 31, directed into the plane
E) 26, directed out of the plane
1) $\vec{S} = \vec{M} - \vec{N}$
2) A
3) B
4) B
5) D
6) D
7) B
8) C
9) E
10) B
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The current definition of the standard second of time is based on
   A) the oscillation of a particular pendulum kept in France.
   B) the earth’s rotation rate.
   C) the duration of one year.
   D) the frequency of radiation emitted by cesium atoms.

2) If a tree is 15 m tall, its height expressed in feet is \( x \) ft, where \( x \) is
   A) less than 15.
   B) greater than 15.

3) The magnitude of a vector can never be less than the magnitude of one of its components.
   A) True
   B) False

4) If a flower is 6.5 cm wide, its width expressed in millimeters is \( x \) mm, where \( x \) is
   A) greater than 6.5.
   B) less than 6.5.

5) Under what condition is \( | \mathbf{A} - \mathbf{B} | = A + B \)?
   A) The magnitude of vector \( \mathbf{B} \) is zero.
   B) Vectors \( \mathbf{A} \) and \( \mathbf{B} \) are in opposite directions.
   C) Vectors \( \mathbf{A} \) and \( \mathbf{B} \) are in perpendicular directions.
   D) Vectors \( \mathbf{A} \) and \( \mathbf{B} \) are in the same direction.
   E) The statement is never true.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

6) If the magnitude of the cross product of two vectors is one-half the dot product of the same vectors, what is the angle between the two vectors?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

7) A plot of land contains 5.8 acres. How many square meters does it contain? [1 acre = 43,560 ft\(^2\)]
   A) \( 5.0 \times 10^4 \) m\(^2\)
   B) \( 2.3 \times 10^4 \) m\(^2\)
   C) \( 7.1 \times 10^3 \) m\(^2\)
   D) \( 7.0 \times 10^4 \) m\(^2\)

8) What is the vector product of \( \mathbf{A} = 2.00 \hat{i} + 3.00 \hat{j} + 1.00 \hat{k} \) and \( \mathbf{B} = 1.00 \hat{i} - 3.00 \hat{j} - 2.00 \hat{k} \)?
   A) \(-4.00 \hat{i} + 3.00 \hat{j} - 1.00 \hat{k}\)
   B) \(-9.00 \hat{i} - 3.00 \hat{j} - 3.00 \hat{k}\)
   C) \(-5.00 \hat{i} + 2.00 \hat{j} - 6.00 \hat{k}\)
   D) \(2.00 \hat{i} - 9.00 \hat{j} - 2.00 \hat{k}\)
   E) \(-3.00 \hat{i} + 5.00 \hat{j} - 9.00 \hat{k}\)
9) Estimate the number of pennies that would fit in a box one foot long by one foot wide by one foot tall.

A) $5 \times 10^4$  
B) $5 \times 10^3$  
C) $5 \times 10^6$  
D) $5 \times 10^5$  
E) $5 \times 10^2$

10) Vectors $\vec{A}$ and $\vec{B}$ are shown in the figure. Vector $\vec{C}$ is given by $\vec{C} = \vec{B} - \vec{A}$. The magnitude of vector $\vec{A}$ is 16.0 units, and the magnitude of vector $\vec{B}$ is 7.00 units. What is the magnitude of vector $\vec{C}$?

A) 17.5  
B) 9.53  
C) 16.2  
D) 9.00  
E) 15.5
Answer Key
Testname: HOMEWORK1-H

1) D
2) B
3) A
4) A
5) B
6) 26.6°
7) B
8) E
9) A
10) C
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) When determining the number of significant figures in a number, zeroes to the left of the decimal point are never counted.
   A) True  
   B) False

2) If a tree is 15 m tall, its height expressed in feet is \( x \) ft, where \( x \) is
   A) less than 15. 
   B) greater than 15.

3) The current definition of the standard kilogram of mass is based on
   A) the mass of the sun. 
   B) the mass a particular object kept in France.   
   C) the mass of the earth. 
   D) the mass of a cesium-133 atom.

4) If two vectors are perpendicular to each other, their cross product must be zero.
   A) True  
   B) False

5) If the magnitude of vector \( \vec{A} \) is less than the magnitude of vector \( \vec{B} \), then the \( x \) component of \( \vec{A} \) is
   less than the \( x \) component of \( \vec{B} \).
   A) True  
   B) False

6) Approximately how many pennies would you have to stack to reach an average 8-foot ceiling?
   A) \( 2 \times 10^4 \) 
   B) \( 2 \times 10^3 \) 
   C) \( 2 \times 10^6 \) 
   D) \( 2 \times 10^5 \) 
   E) \( 2 \times 10^2 \)

7) The angle between vector \( \vec{A} = 2.00\hat{i} + 3.00\hat{j} \) and vector \( \vec{B} \) is 45.0°. The scalar product of vectors \( \vec{A} \) and \( \vec{B} \) is 3.00. If the \( x \) component of vector \( \vec{B} \) is positive, what is vector \( \vec{B} \)?
   A) \( 4.76\hat{i} + 0.952\hat{j} \) 
   B) \( 3.42\hat{i} + 0.684\hat{j} \) 
   C) \( 2.96\hat{i} - 0.973\hat{j} \) 
   D) \( 0.871\hat{i} + 0.419\hat{j} \) 
   E) \( 1.15\hat{i} + 0.231\hat{j} \)

8) The components of vector \( \vec{B} \) are \( B_x = -3.5 \) and \( B_y = -9.7 \), and the components of vector \( \vec{C} \) are \( C_x = -6 \) and \( C_y = +8.1 \). What is the angle (less than 180 degrees) between vectors \( \vec{B} \) and \( \vec{C} \)?
   A) 124° 
   B) 56° 
   C) 17° 
   D) 106° 
   E) 163°

9) The exhaust fan on a typical kitchen stove pulls 600 CFM (cubic feet per minute) through the filter. 
   Given that 1.00 in. = 2.54 cm, how many cubic meters per second does this fan pull?
   A) 0.328 m³/sec 
   B) 3.05 m³/sec 
   C) 32.8 m³/sec 
   D) 0.283 m³/sec
10) The position \( x \), in meters, of an object is given by the equation \( x = A + Bt + Ct^2 \), where \( t \) represents time in seconds. What are the SI units of \( A \), \( B \), and \( C \)?

A) \( m \), \( m/s \), \( m/s^2 \)
B) \( m/s \), \( m/s^2 \), \( m/s^3 \)
C) \( m \), \( s \), \( s^2 \)
D) \( m \), \( m \), \( m \)
E) \( m \), \( s \), \( s \)
Answer Key
Testname: HOMEWORK1-I

1) B
2) B
3) B
4) B
5) B
6) B
7) E
8) A
9) D
10) D
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If two vectors are perpendicular to each other, their cross product must be zero.
   A) True  
   B) False

2) If the eastward component of vector $\vec{A}$ is equal to the westward component of vector $\vec{B}$ and their northward components are equal. Which one of the following statements about these two vectors is correct?
   A) The magnitude of vector $\vec{A}$ is twice the magnitude of vector $\vec{B}$.
   B) Vector $\vec{A}$ is perpendicular to vector $\vec{B}$.
   C) Vector $\vec{A}$ is parallel to vector $\vec{B}$.
   D) Vectors $\vec{A}$ and $\vec{B}$ point in opposite directions.
   E) The magnitude of vector $\vec{A}$ is equal to the magnitude of vector $\vec{B}$.

3) When determining the number of significant figures in a number, zeroes to the left of the decimal point are never counted.
   A) True  
   B) False

4) If the magnitude of vector $\vec{A}$ is less than the magnitude of vector $\vec{B}$, then the $x$ component of $\vec{A}$ is less than the $x$ component of $\vec{B}$.
   A) False  
   B) True

5) The current definition of the standard meter of length is based on
   A) the distance between the earth’s equator and north pole.
   B) the length of a particular object kept in France.
   C) the distance between the earth and the sun.
   D) the distance traveled by light in a vacuum.

6) What is the result of $1.58 \div 3.793$ written with the correct number of significant figures?
   A) $4.2 \times 10^{-1}$  
   B) $4.17 \times 10^{-1}$  
   C) $4 \times 10^{-1}$  
   D) $4.1656 \times 10^{-1}$  
   E) $4.166 \times 10^{-1}$

7) Vector $\vec{A} = -3.00 \hat{i} + 3.00 \hat{j}$ and vector $\vec{B} = 3.00 \hat{i} + 4.00 \hat{j}$. What is vector $\vec{C} = \vec{A} + \vec{B}$?
   A) $-3.00 \hat{i} + 7.00 \hat{j}$  
   B) $0.00 \hat{i} + 3.00 \hat{j}$  
   C) $7.00 \hat{i} + 7.00 \hat{j}$  
   D) $-3.00 \hat{i} - 3.00 \hat{j}$  
   E) $0.00 \hat{i} + 7.00 \hat{j}$
8) What is the product of 11.24 and 1.95 written with the correct number of significant figures?
A) 22  B) 21.9  C) 21.92  D) 21.918  E) 21.9180

9) What is the sum of 1123 and 10.3 written with the correct number of significant figures?
A) 1133.3000  B) 1.1 × 10^3  C) 1.13 × 10^3  D) 1133  E) 1133.3

10) Determine the scalar product of \( \vec{A} = 6.0 \hat{i} + 4.0 \hat{j} - 2.0 \hat{k} \) and \( \vec{B} = 5.0 \hat{i} - 6.0 \hat{j} - 3.0 \hat{k} \).
A) 60  B) 30 \( \hat{i} + 24 \hat{j} + 6 \hat{k} \)  C) 30 \( \hat{i} - 24 \hat{j} + 6 \hat{k} \)  D) 12  E) undefined
Answer Key
Testname: HOMEWORK1-J

1) B
2) E
3) B
4) A
5) D
6) B
7) E
8) B
9) D
10) D
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) If a tree is 15 m tall, its height expressed in feet is \( x \) ft, where \( x \) is
   A) greater than 15.  
   B) less than 15.

2) If two vectors are perpendicular to each other, their cross product must be zero.
   A) True  
   B) False

3) If \( \vec{A} - \vec{B} = 0 \), then the vectors \( \vec{A} \) and \( \vec{B} \) have equal magnitudes and are directed in the opposite directions from each other.
   A) True  
   B) False

4) If \( A > B \), under what condition is \( | \vec{A} - \vec{B} | = A - B \)?
   A) Vectors \( \vec{A} \) and \( \vec{B} \) are in perpendicular directions.  
   B) Vectors \( \vec{A} \) and \( \vec{B} \) are in opposite directions.  
   C) The statement is never true.  
   D) Vectors \( \vec{A} \) and \( \vec{B} \) are in the same direction.  
   E) The statement is always true.

5) The current definition of the standard meter of length is based on
   A) the distance between the earth’s equator and north pole.  
   B) the distance between the earth and the sun.  
   C) the length of a particular object kept in France.  
   D) the distance traveled by light in a vacuum.

6) If \( \vec{B} = -2\hat{i} - 6\hat{j} + 2\hat{k} \) and \( \vec{C} = -2\hat{i} - 2\hat{j} - 3\hat{k} \), which of the following numbers is closest to the magnitude of \( \vec{C} \times \vec{B} \)?
   A) 25  
   B) 13  
   C) 21  
   D) 9  
   E) 17

7) A helicopter is flying horizontally with a speed of 444 m/s over a hill that slopes upward with a 2% grade (that is, the “rise” is 2% of the “run”). What is the component of the helicopter’s velocity perpendicular to the sloping surface of the hill?
   A) 220 m/s  
   B) 444 m/s  
   C) 435 m/s  
   D) 8.9 m/s

8) A certain CD-ROM disk can store approximately \( 6.0 \times 10^2 \) megabytes of information, where \( 10^6 \) bytes = 1 megabyte. If an average word requires 9.0 bytes of storage, how many words can be stored on one disk?
   A) \( 6.7 \times 10^7 \) words  
   B) \( 2.0 \times 10^9 \) words  
   C) \( 2.1 \times 10^7 \) words  
   D) \( 5.4 \times 10^9 \) words

9) What is the value of \( \pi(8.104)^2 \), written with the correct number of significant figures?
   A) 206.324  
   B) 206.323  
   C) 206.3  
   D) 206  
   E) 200
10) A plot of land contains 5.8 acres. How many square meters does it contain? [1 acre = 43,560 ft²]

A) $5.0 \times 10^4$ m²  
B) $2.3 \times 10^4$ m²  
C) $7.1 \times 10^3$ m²  
D) $7.0 \times 10^4$ m²
Answer Key
Testname: HOMEWORK1-K

1) A
2) B
3) B
4) D
5) D
6) A
7) D
8) A
9) C
10) B