All Assignments

Chapter 1

Edit

Overview Diagnostics Print View with Answers

Chapter 1

Due: 11:59pm on Sunday, January 22, 2023

To understand how points are awarded, read the Grading Policy for this assignment.

Exercise 1.6 - Enhanced - with Feedback

Description: The following conversions occur frequently in physics and are very useful. (a) Use 1 mi = 5280 ft and 1 h = 3600 s to convert 60 mph to units of ft/s. (b) The acceleration of a freely falling object is 32 ft/s^2. Use 1 ft = 30.48 cm to...

The following conversions occur frequently in physics and are very useful.

Part A

Use 1 mi = 5280 ft and 1 h = 3600 s to convert 60 mph to units of $\mathrm{ft/s}$.

Express your answer in feets per second.

ANSWER:

60 mph = 88 $\mathrm{ft/s}$

Also accepted: 88.0, 88

Part B

The acceleration of a freely falling object is 32 $\mathrm{ft/s^2}$. Use 1 ft = 30.48 cm to express this acceleration in units of $\mathrm{m/s^2}$.

Express your answer in meters per square second.

ANSWER:

32 $\mathrm{ft/s^2}$ = 9.8 $\mathrm{m/s^2}$

Also accepted: 9.75, 9.8

Part C

The density of water is 1.0 $\mathrm{g/cm^3}$. Convert this density to units of $\mathrm{kg/m^3}$.

Express your answer in kilograms per cubic meter.

ANSWER:

1.0 $\mathrm{g/cm^3}$ = 1000 $\mathrm{kg/m^3}$

Also accepted: 1000, 1000

Exercise 1.30 - Enhanced - with Feedback

Description: (a) Find the magnitude of the vector A_1_vec represented by the pair of components: A_x_1= A_x_1 cm, A_y_1= A_y_1 cm. (b) Let the direction of a vector be the angle that the vector makes with the +x-axis, measured counterclockwise ...

Part A

Find the magnitude of the vector $\vec{A}_1$ represented by the pair of components: $A_{x_1} =$ -9.30 cm, $A_{y_1} =$ 4.30 cm.

Express your answer in centimeters.

ANSWER:

$|\vec{A}_1| = \sqrt{(A_{x_1}{}^2 + A_{y_1}{}^2)} = 10.2 \text{ cm}$

Part B

Let the direction of a vector be the angle that the vector makes with the +x-axis, measured *counterclockwise* from that axis. Find the direction of the vector $\vec{A}_1$.

Express your answer in degrees.

ANSWER:

angle = $180 - \text{atan}\left(\frac{A_{y_1}}{-A_{x_1}}\right) = 155 \ ^\circ$

Part C

Find the magnitude of the vector $\vec{A}_2$ represented by the pair of components: $A_{x_2} =$ -9.70 m, $A_{y_2} =$ -1.60 m.

Express your answer in meters.

ANSWER:

$|\vec{A}_2| = \sqrt{(A_{x_2}{}^2 + A_{y_2}{}^2)} = 9.83 \text{ m}$

Part D

Find the direction of the vector $\vec{A}_2$. Let the direction of a vector be the angle that the vector makes with the +x-axis, measured *counterclockwise* from that axis.

Express your answer in degrees.

ANSWER:

angle = $360 - \text{acos}\left(\frac{A_{x_2}}{\sqrt{(A_{x_2}{}^2 + A_{y_2}{}^2)}}\right) = 189 \ ^\circ$

Part E

Find the magnitude of the vector $\vec{A}_3$ represented by the pair of components: $A_{x_3} =$ 8.15 km, $A_{y_3} =$ -3.70 km.

Express your answer in kilometers.

ANSWER:

$|\vec{A}_3| = \sqrt{(A_{x_3}{}^2 + A_{y_3}{}^2)} = 8.95 \text{ km}$

Part F

Find the direction of the vector $\vec{A}_3$. Let the direction of a vector be the angle that the vector makes with the +x-axis, measured *counterclockwise* from that axis.

Express your answer in degrees.

ANSWER:

angle = $360 - \text{acos}\left(\frac{A_{x_3}}{\sqrt{({A_{x_3}}^2 + {A_{y_3}}^2)}}\right)$ = 336 °

Also accepted: $-\text{acos}\left(\frac{A_{x_3}}{\sqrt{({A_{x_3}}^2 + {A_{y_3}}^2)}}\right)$ = -24.4, $360 - \text{acos}\left(\frac{A_{x_3}}{\sqrt{({A_{x_3}}^2 + {A_{y_3}}^2)}}\right)$ = 336

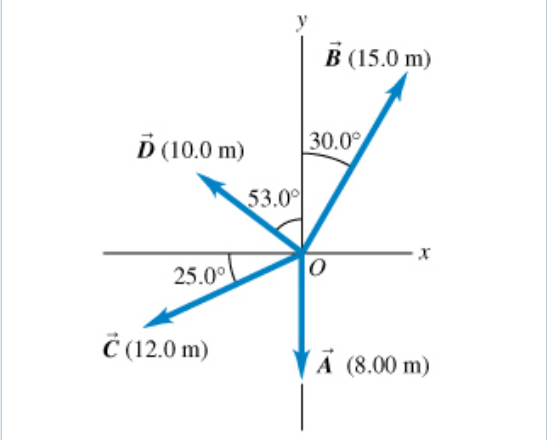
Exercise 1.22 - Enhanced - with Feedback

Description: (a) For the vectors A_vec and B_vec in the figure , use a scale drawing to find the magnitude of the vector sum A_vec+B_vec. (b) Find the direction of the vector sum A_vec+B_vec. (c) Find the magnitude of the vector difference A_vec - B_vec. (d) ...

Part A

For the vectors $\vec{A}$ and $\vec{B}$ in the figure , use a scale drawing to find the magnitude of the vector sum $\vec{A} + \vec{B}$.

Express your answer in meters.



ANSWER:

$|\vec{A} + \vec{B}|$ = 9.0 m

Also accepted: 9.01, 9.0

Part B

Find the direction of the vector sum $\vec{A} + \vec{B}$.

Express your answer in degrees.

ANSWER:

angle = 34 ° counterclockwise from $+x$-axis

Also accepted: 33.6, -326, 34

Part C

Find the magnitude of the vector difference $\vec{A} - \vec{B}$.

Express your answer in meters.

ANSWER:

$|\vec{A} - \vec{B}|$ = 22 m

Also accepted: 22.3, 22

Part D

Find the direction of the vector difference $\vec{A} - \vec{B}$.

Express your answer in degrees.

ANSWER:

angle = 250 ° counterclockwise from $+x$-axis

Also accepted: -110, 250

Part E

Use your answers to find the magnitude of $-\vec{A} - \vec{B}$.

Express your answer in meters.

ANSWER:

$|-\vec{A} - \vec{B}|$ = 9.0 m

Also accepted: 9.01, 9.0

Part F

Find the direction of $-\vec{A} - \vec{B}$.

Express your answer in degrees.

ANSWER:

angle = 214 ° counterclockwise from $+x$-axis

Also accepted: -146, 214

Part G

Find the magnitude of $\vec{B} - \vec{A}$.

Express your answer in meters.

ANSWER:

$|\vec{B} - \vec{A}|$ = 22 m

Also accepted: 22.3, 22

Part H

Find the direction of $\vec{B} - \vec{A}$.

Express your answer in degrees.

ANSWER:

angle = 70 ° counterclockwise from $+x$-axis

Also accepted: 70.3, -290, 70

Exercise 1.23

Description: A spelunker is surveying a cave. She follows a passage ## m straight west, then s2 in a direction 45 degree(s) east of south, and then 280 m at 30 degree(s) east of north. After a fourth unmeasured displacement, she finds herself back ...

A spelunker is surveying a cave. She follows a passage 130 m straight west, then 230 m in a direction 45° east of south, and then 280 m at 30° east of north. After a fourth unmeasured displacement, she finds herself back where she started.

Part A

Use a scale drawing to determine the magnitude of the fourth displacement.

Express your answer in meters.

ANSWER:

$\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}$ = 190 m

Also accepted: $\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}$ = 190, $\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}$ = 190

Part B

Determine the direction of the fourth displacement.

Express your answer in degrees.

ANSWER:

$\mathrm{asin}\left(\frac{140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}}{\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}}\right)$ = 25 ° South of West

Also accepted: $\mathrm{asin}\left(\frac{140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}}{\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}}\right)$ = 24.8, $\mathrm{asin}\left(\frac{140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}}{\sqrt{\left(\left(140\cdot\sqrt{3}-\frac{s2}{\sqrt{2}}\right)^2+\left(\frac{s2}{\sqrt{2}}+140-s1\right)^2\right)}}\right)$ = 25

Exercise 1.36 - Enhanced - with Feedback

Description: (a) Given the vector A_vec = 4.00 i_unit + 7.00 j_unit , find the magnitude of the vector. (b) Given the vector B_vec = 5.00 i_unit -2.00 j_unit , find the magnitude of the vector. (c) Write an expression for the vector difference A_vec - B_vec...

Part A

Given the vector $\vec{A} = 4.00\hat{i} + 7.00\hat{j}$, find the magnitude of the vector.

ANSWER:

$|\vec{A}|$ = 8.06

Part B

Given the vector $\vec{B} = 5.00\hat{i} - 2.00\hat{j}$, find the magnitude of the vector.

ANSWER:

$|\vec{B}|$ = 5.39

Part C

Write an expression for the vector difference $\vec{A} - \vec{B}$ using unit vectors.

Express your answer in terms of the unit vectors $\hat{i}$ and $\hat{j}$. Use the 'unit vector' button to denote unit vectors in your answer.

ANSWER:

$\vec{A} - \vec{B}$ = $-1.00\hat{i} + 9.00\hat{j}$

Part D

Find the magnitude of the vector difference $\vec{A} - \vec{B}$.

ANSWER:

$|\vec{A} - \vec{B}|$ = 9.06

Part E

Find the direction of the vector difference $\vec{A} - \vec{B}$.

Express your answer in degrees.

ANSWER:

96.3 $^\circ$ counterclockwise from +x direction

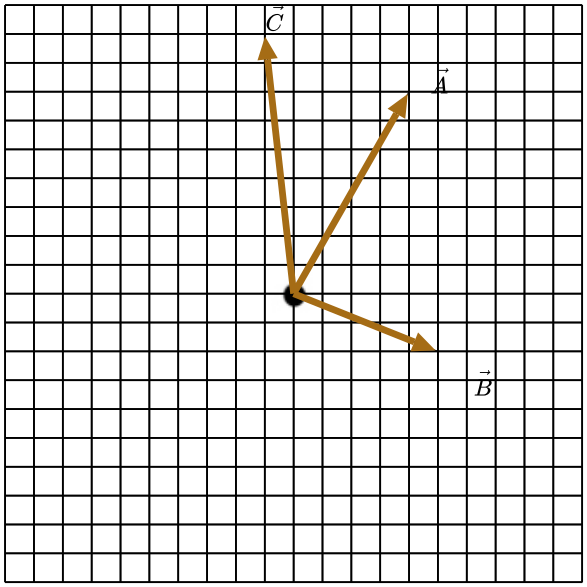
Part F

In a vector diagram show $\vec{A}$, $\vec{B}$, and $\vec{C} = \vec{A} - \vec{B}$.

Draw the vectors starting at the black dot. Both the orientation and length of your vectors will be graded.

ANSWER:

No elements selected



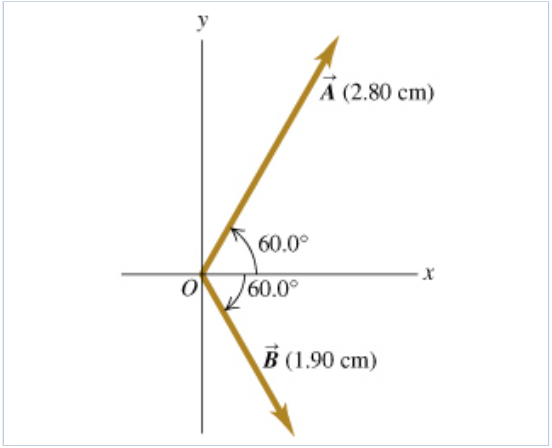
Exercise 1.44 - Enhanced - with Feedback

Description: (a) For the two vectors in the figure , find the magnitude of the vector product A_vec * B_vec. (b) Find the direction of the vector product A_vec * B_vec. (c) Find the magnitude of B_vec * A_vec. (d) Find the direction of B_vec * A_vec.

Part A

For the two vectors in the figure , find the magnitude of the vector product $\vec{A} \times \vec{B}$.

Express your answer in square centimeters.



ANSWER:

$|\vec{A} \times \vec{B}|$ = 4.61 cm^2

Part B

Find the direction of the vector product $\vec{A} \times \vec{B}$.

ANSWER:

- +z-direction
- -z-direction
- +x-direction
- -x-direction

Part C

Find the magnitude of $\vec{B} \times \vec{A}$.

Express your answer in square centimeters.

ANSWER:

4.61 cm^2

Part D

Find the direction of $\vec{B} \times \vec{A}$.

ANSWER:

- +z-direction
- -z-direction
- +x-direction
- -x-direction

Problem 1.62

Description: On a training flight, a student pilot flies from Lincoln, Nebraska to Clarinda, Iowa, then to St. Joseph, Missouri, and then to Manhattan, Kansas . The directions are shown relative to north: 0 degree(s)is north, 90 degree(s)is east, 180 degree(s) is...

On a training flight, a student pilot flies from Lincoln, Nebraska to Clarinda, Iowa, then to St. Joseph, Missouri, and then to Manhattan, Kansas . The directions are shown relative to north: $0^\circ$is north, $90^\circ$is east, 180° is south, and 270° is west.

Part A

Use the method of components to find the distance she has to fly from Manhattan to get back to Lincoln.

Express your answer in kilometers.

ANSWER:

189 km

Part B

Find the direction (relative to north) she must fly to get there.

Express your answer in degrees.

ANSWER:

θ = -10.5 °

Also accepted: 350, -10.5

Problem 1.64

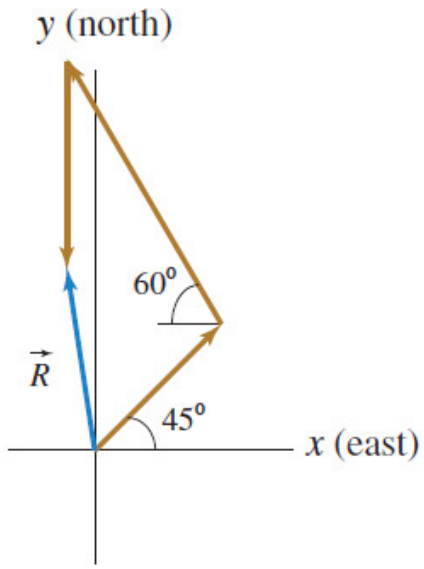
Description: An explorer in Antarctica leaves his shelter during a whiteout. He takes n1 steps northeast, then n2 steps at an angle 60 degree(s) north of west, then n3 steps due south. Assume his steps all have equal length. (a) Select the...

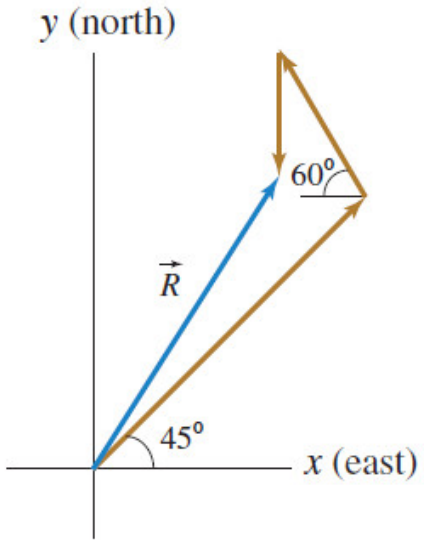
An explorer in Antarctica leaves his shelter during a whiteout. He takes 39 steps northeast, then 84 steps at an angle 60° north of west, then 46 steps due south. Assume his steps all have equal length.

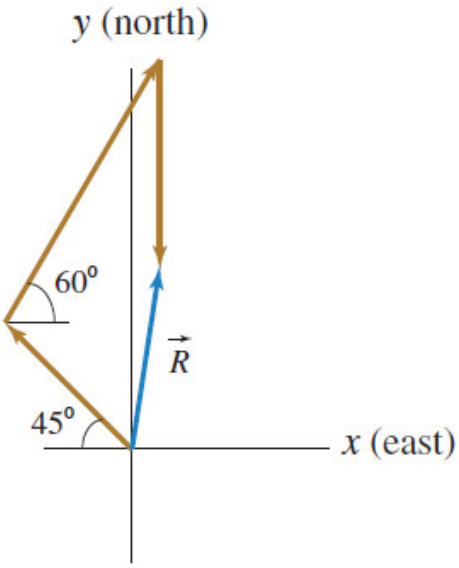
Part A

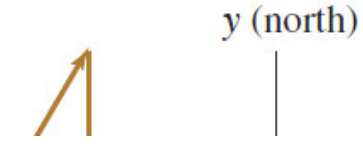
Select the correct diagram, roughly to scale, of the three vectors and their resultant.

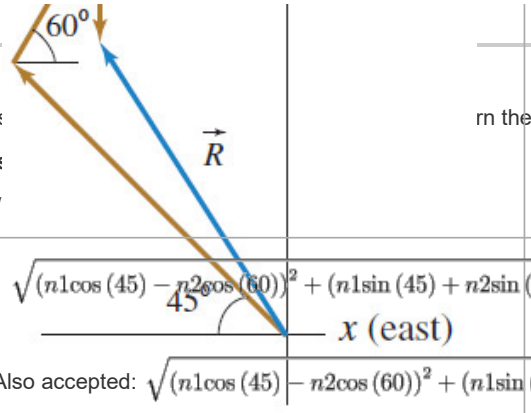
ANSWER:


y (north)
60°
$\vec{R}$
45°
x (east)


y (north)
60°
$\vec{R}$
45°
x (east)


y (north)
60°
$\vec{R}$
45°
x (east)


y (north)



Part B

What is rn the explorer to his shelter?

Expres

ANSW

$R =$ $\sqrt{(n1\cos(45) - n2\cos(60))^2 + (n1\sin(45) + n2\sin(60) - n3)^2}$ = 56 steps

Also accepted: $\sqrt{(n1\cos(45) - n2\cos(60))^2 + (n1\sin(45) + n2\sin(60) - n3)^2}$ = 56.2, $\sqrt{(n1\cos(45) - n2\cos(60))^2 + (n1\sin(45) + n2\sin(60) - n3)^2}$ = 56

Part C

What is the direction of the displacement that will return the explorer to his shelter?

Express your answer in degrees.

ANSWER:

$\theta =$ $90 - \operatorname{atan}\left(\frac{1}{\frac{-n1\cos(45)+n2\cos(60)}{n1\sin(45)+n2\sin(60)-n3}}\right)$ = 15 ° east of south

Also accepted: $90 - \operatorname{atan}\left(\frac{1}{\frac{-n1\cos(45)+n2\cos(60)}{n1\sin(45)+n2\sin(60)-n3}}\right)$ = 14.9, $90 - \operatorname{atan}\left(\frac{1}{\frac{-n1\cos(45)+n2\cos(60)}{n1\sin(45)+n2\sin(60)-n3}}\right)$ = 15

Problem 1.72

Description: Ricardo and Jane are standing under a tree in the middle of a pasture. An argument ensues, and they walk away in different directions. Ricardo walks l1 in a direction 60.0 degree(s) west of north. Jane walks l2 in a direction 30.0 degree(s) south of...

Ricardo and Jane are standing under a tree in the middle of a pasture. An argument ensues, and they walk away in different directions. Ricardo walks 24.0 m in a direction 60.0° west of north. Jane walks 16.0 m in a direction 30.0° south of west. They then stop and turn to face each other.

Part A

What is the distance between them?

Express your answer with the appropriate units.

ANSWER:

$d =$ $\sqrt{l1^2 + l2^2 - l1l2}$ = 21.2 m

Part B

In what direction should Ricardo walk to go directly toward Jane?

Express your answer in degrees.

ANSWER:

$\text{atan}\left(\frac{l1-l2}{l1+l2}\sqrt{3}\right)$ = 19.1 ° east of south

All Assignments

University Physics with Modern Physics, 15e
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