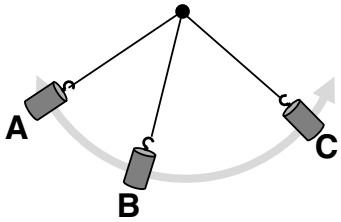
Pendulum Motion: x, v, and F

Activity 1: Speed and Force Comparison

Question Group 1

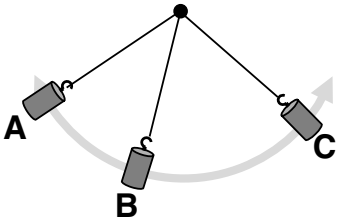
Question 1

A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum moving with the **greatest speed**?



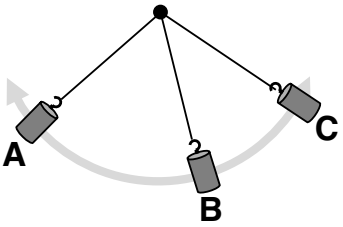
Question 2

A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum moving with the **smallest speed**?



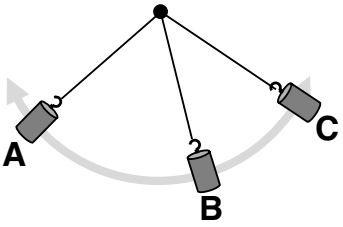
Question 3

A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum moving with the **greatest speed**?



Question 4

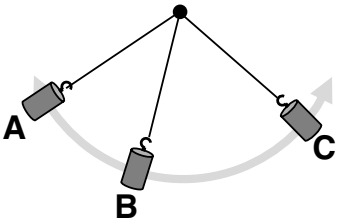
A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum moving with the **smallest speed**?



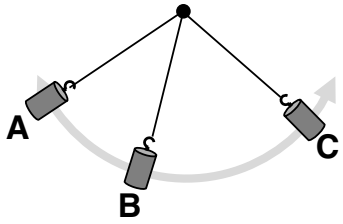
Question Group 2

Question 5

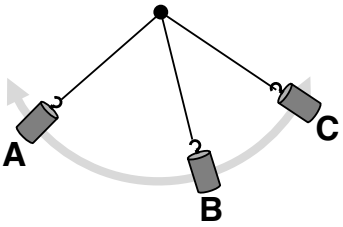
A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum experiencing the **greatest net force**?



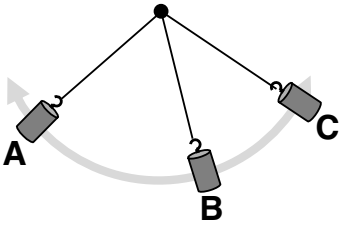
Question 6
A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum experiencing the **smallest net force**?



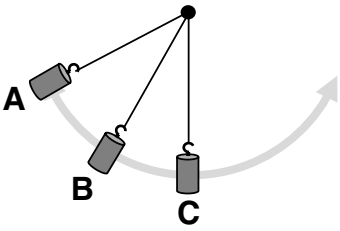
Question 7
A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum experiencing the **greatest net force**?



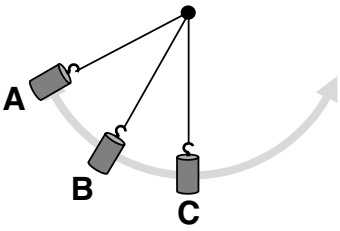
Question 8
A pendulum is swinging back and forth. Three points along its circular arc are shown. At which location is the pendulum experiencing the **smallest net force**?



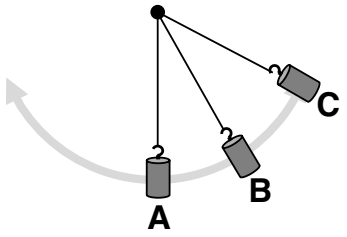
Question Group 3
Question 9
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location A. At which location is the pendulum experiencing the **smallest net force**?



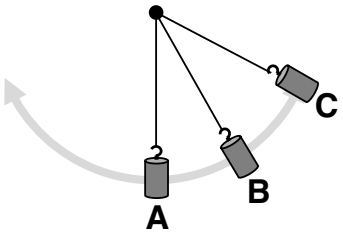
Question 10
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location A. At which location is the pendulum experiencing the **smallest net force**?



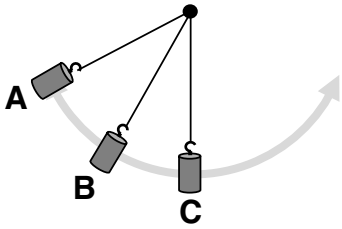
Question 11
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location C. At which location is the pendulum experiencing the **smallest net force**?



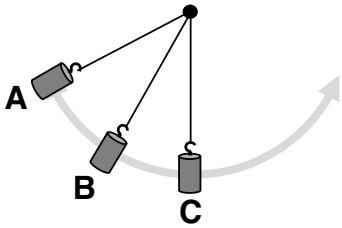
Question 12
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location C. At which location is the pendulum experiencing the **smallest net force**?



Question Group 4
Question 13
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location A. At which location is the pendulum experiencing a **zero speed**?

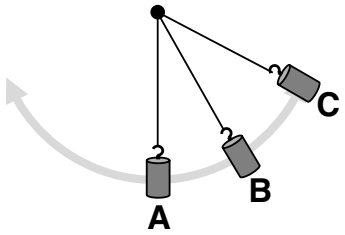


Question 14
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location A. At which location is the pendulum experiencing a **zero speed**?



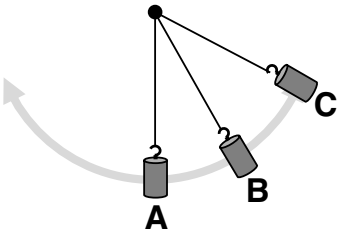
Question 15

A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location C. At which location is the pendulum experiencing a **zero speed**?



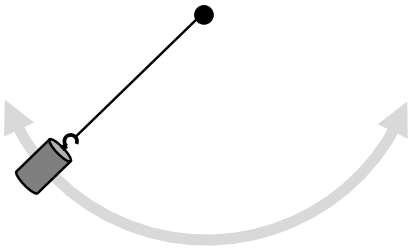
Question 16

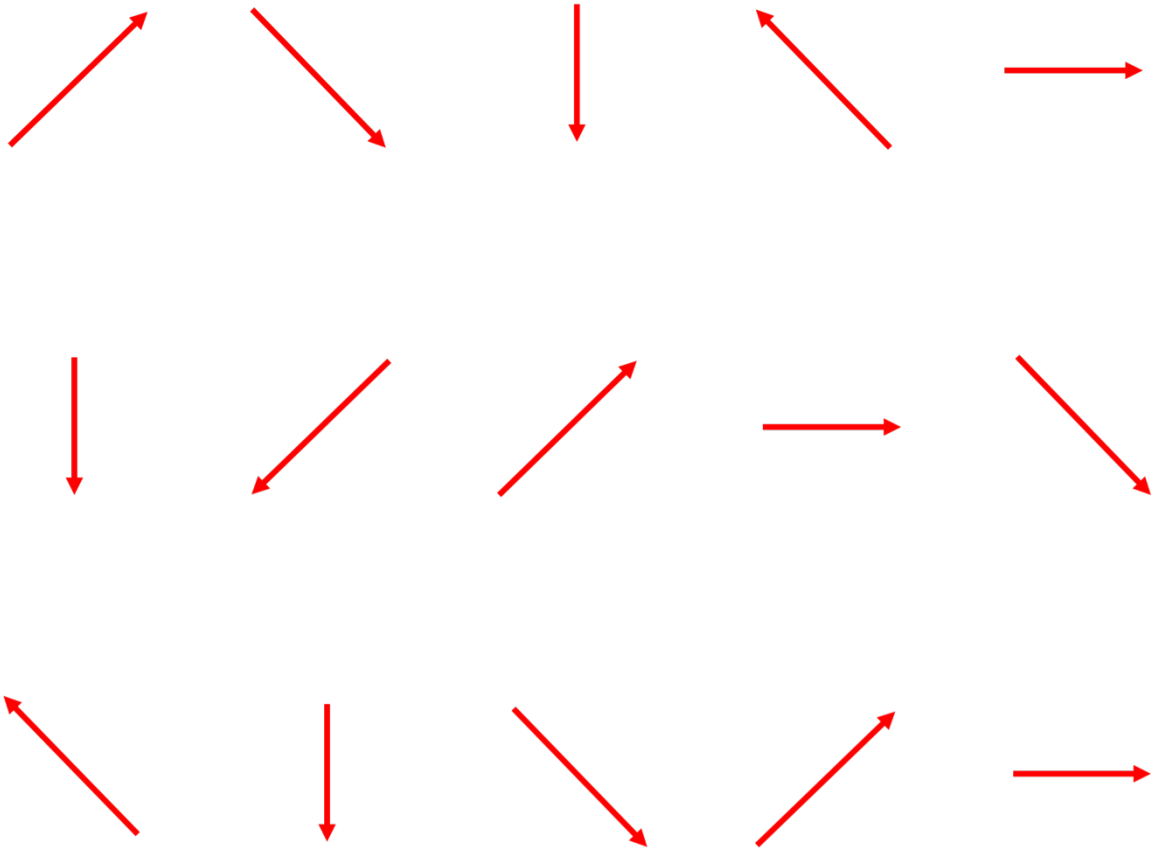
A pendulum is swinging back and forth. Three points along its circular arc are shown. The highest point reached by the pendulum is location C. At which location is the pendulum experiencing a **zero speed**?



Activity 2: Vector Analysis
Question Group 5
Question 17

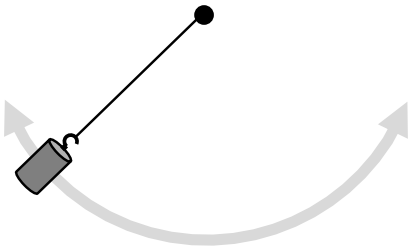
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

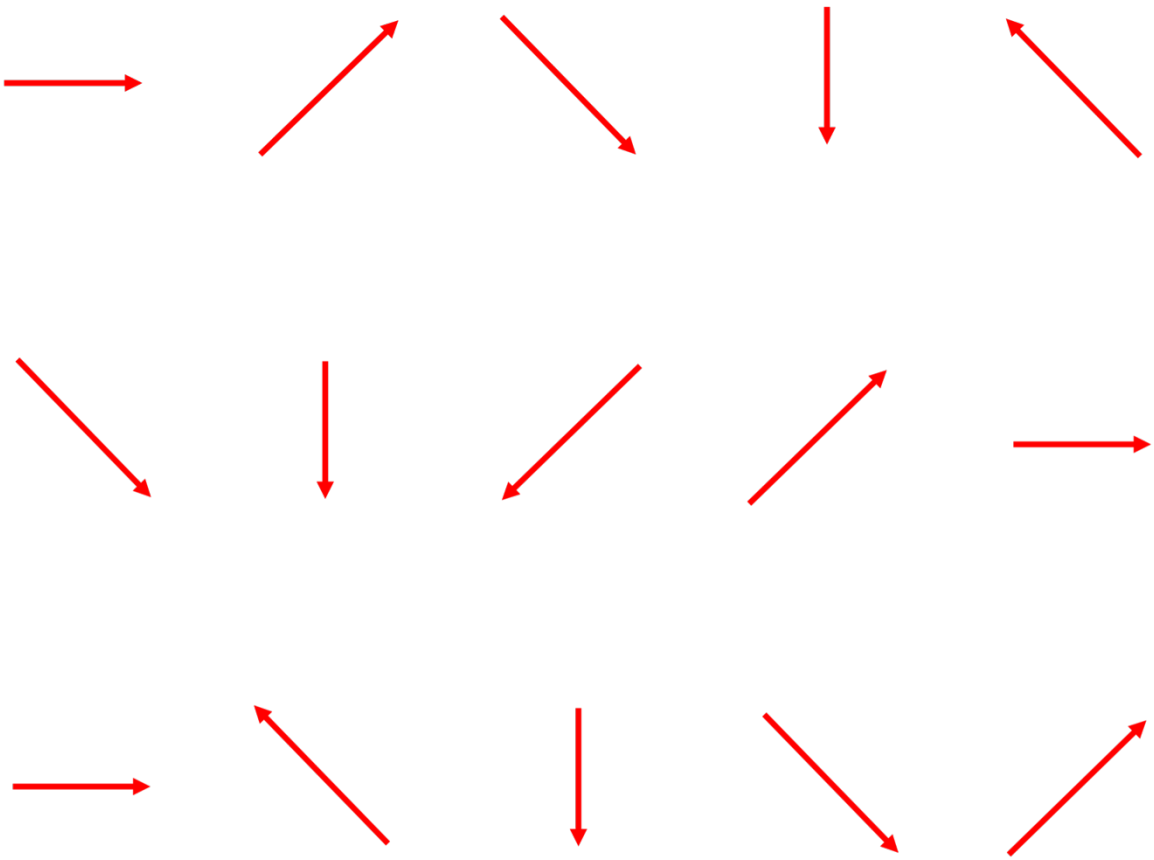




Question 18

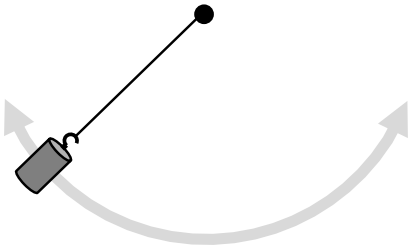
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

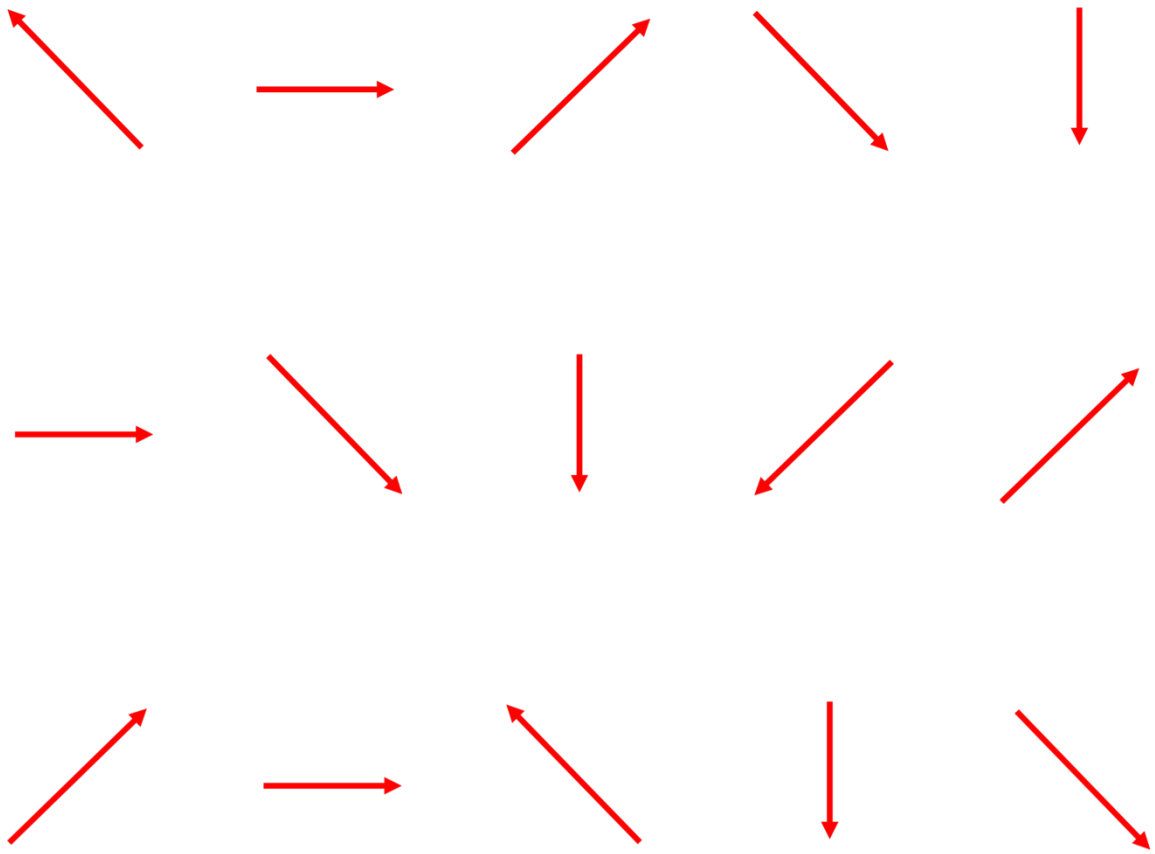




Question 19

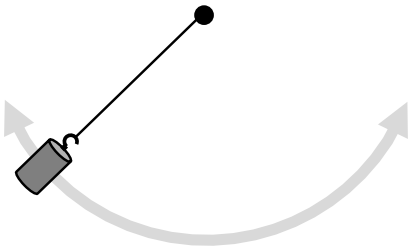
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

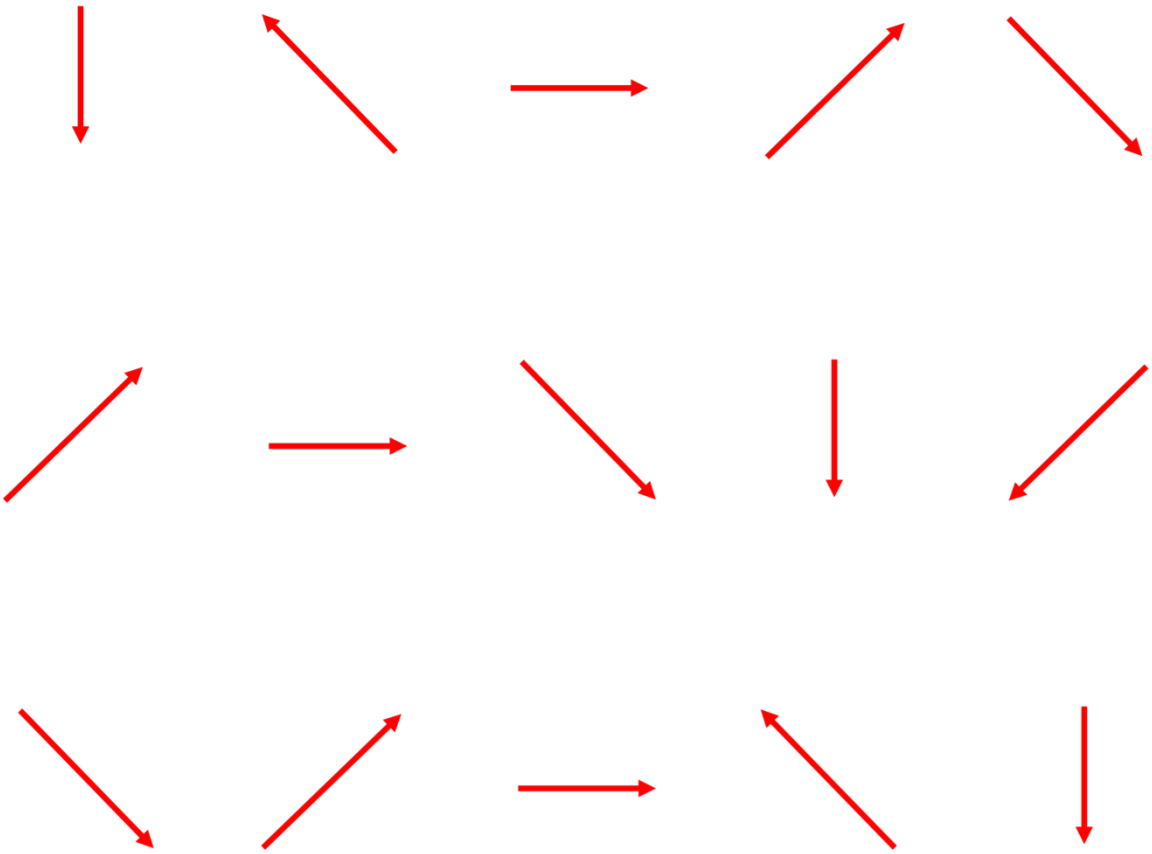




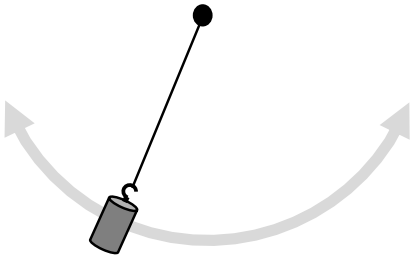
Question 20

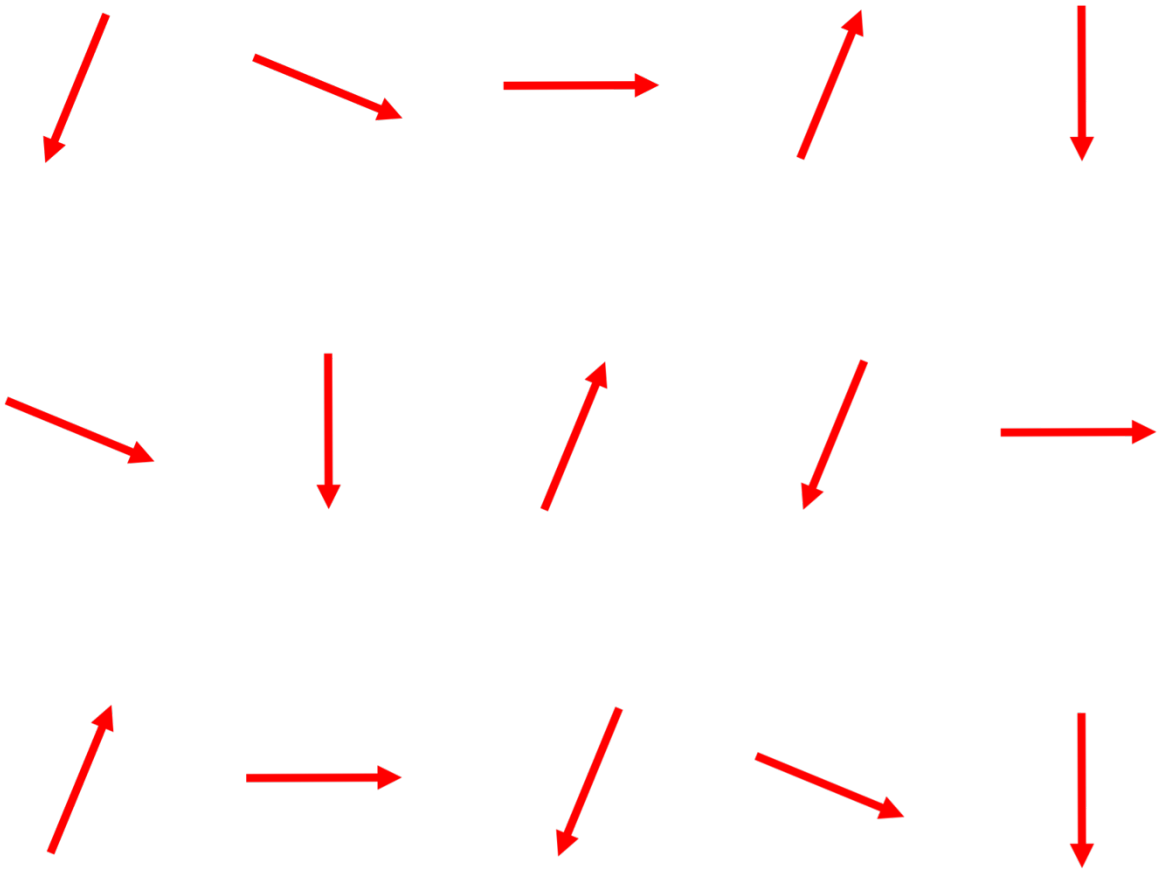
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.





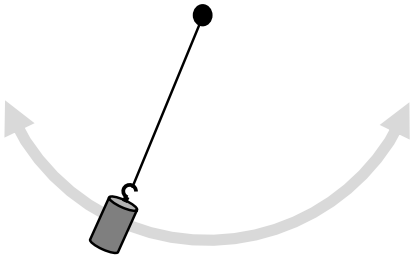
Question Group 6
Question 21
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

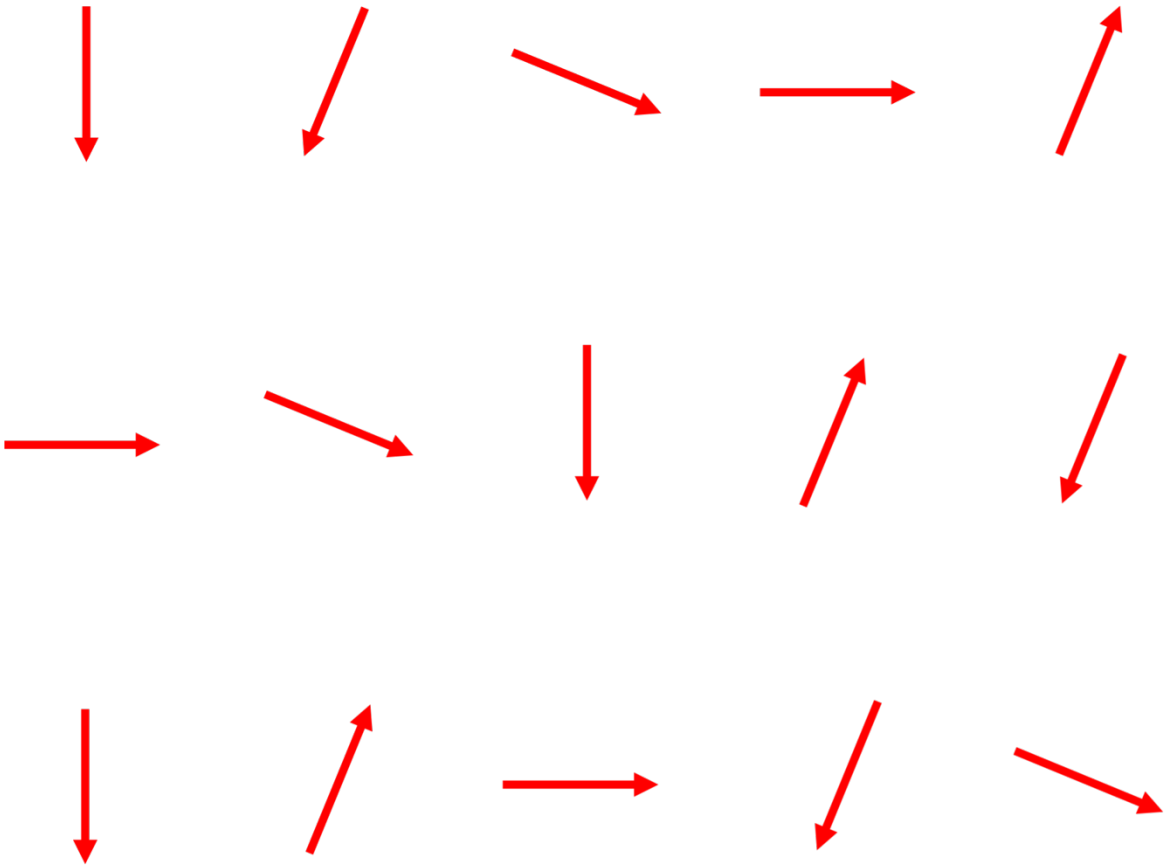




Question 22

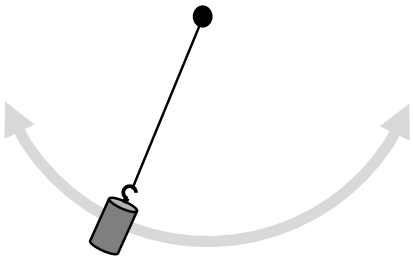
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

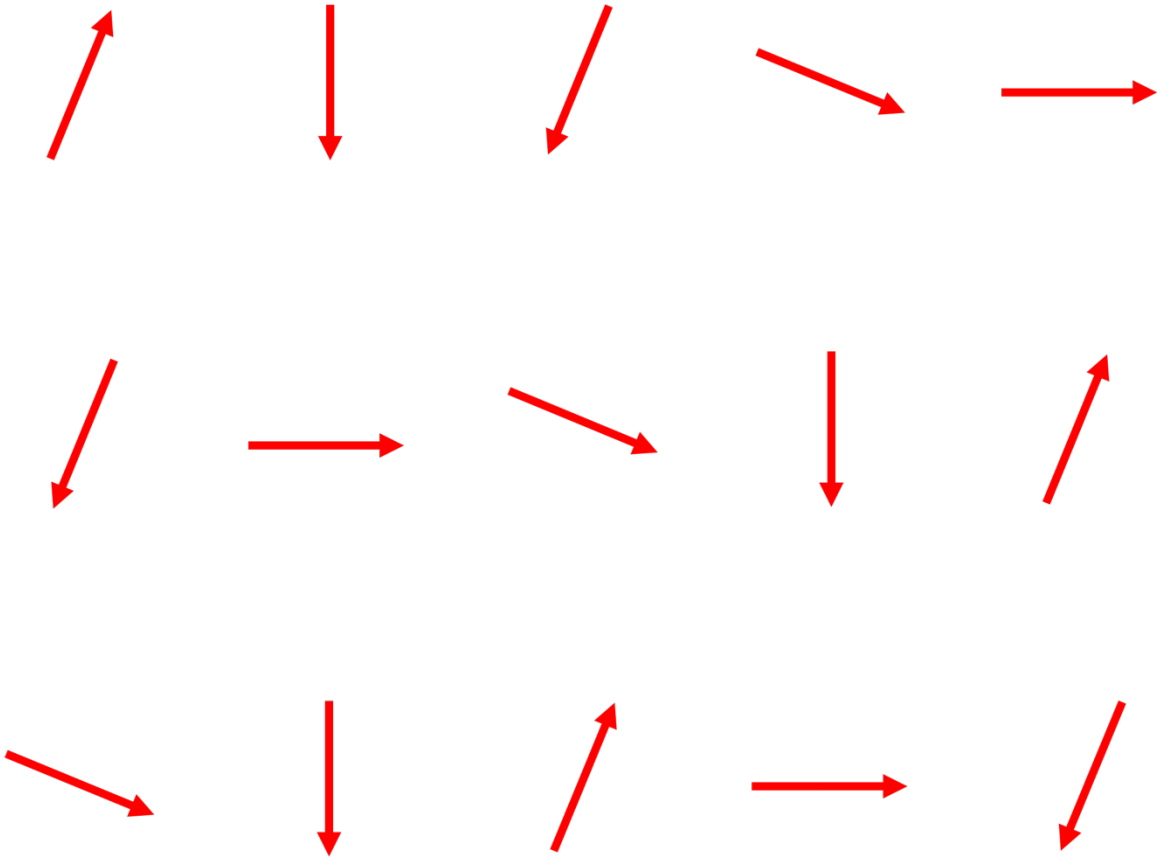




Question 23

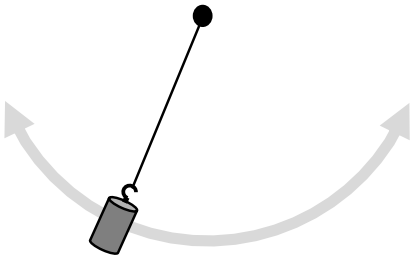
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

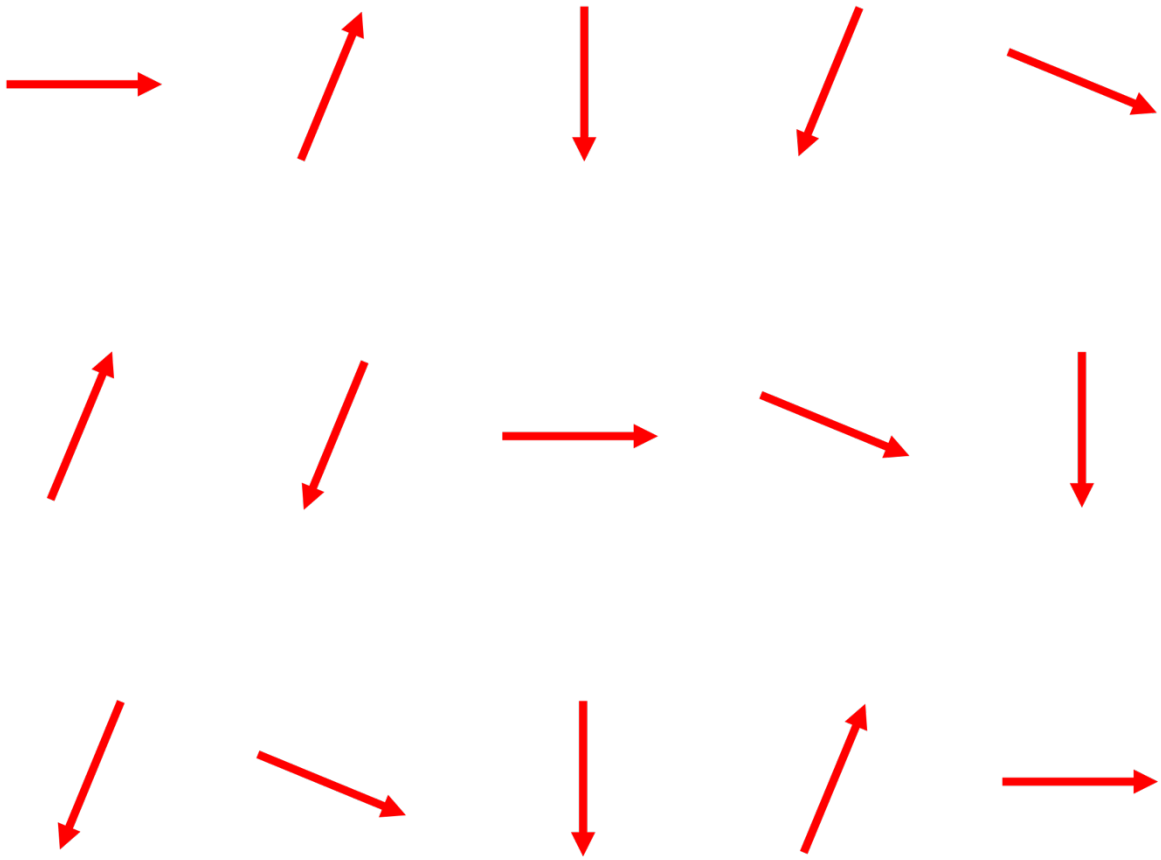




Question 24

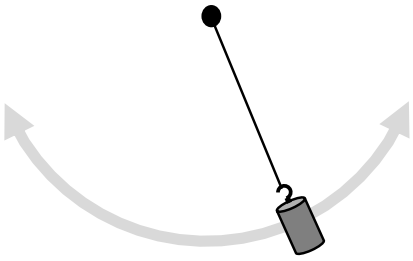
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

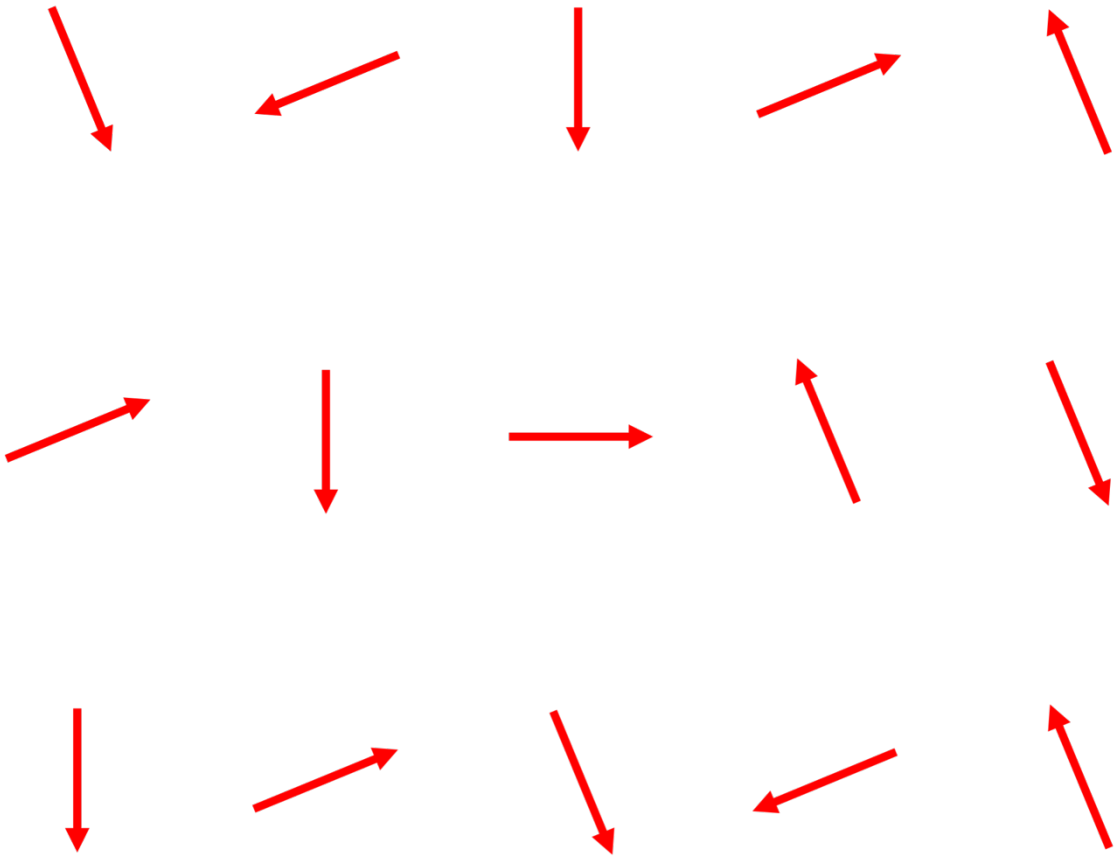




Question Group 7
Question 25

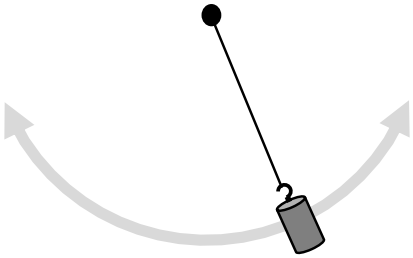
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away from its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

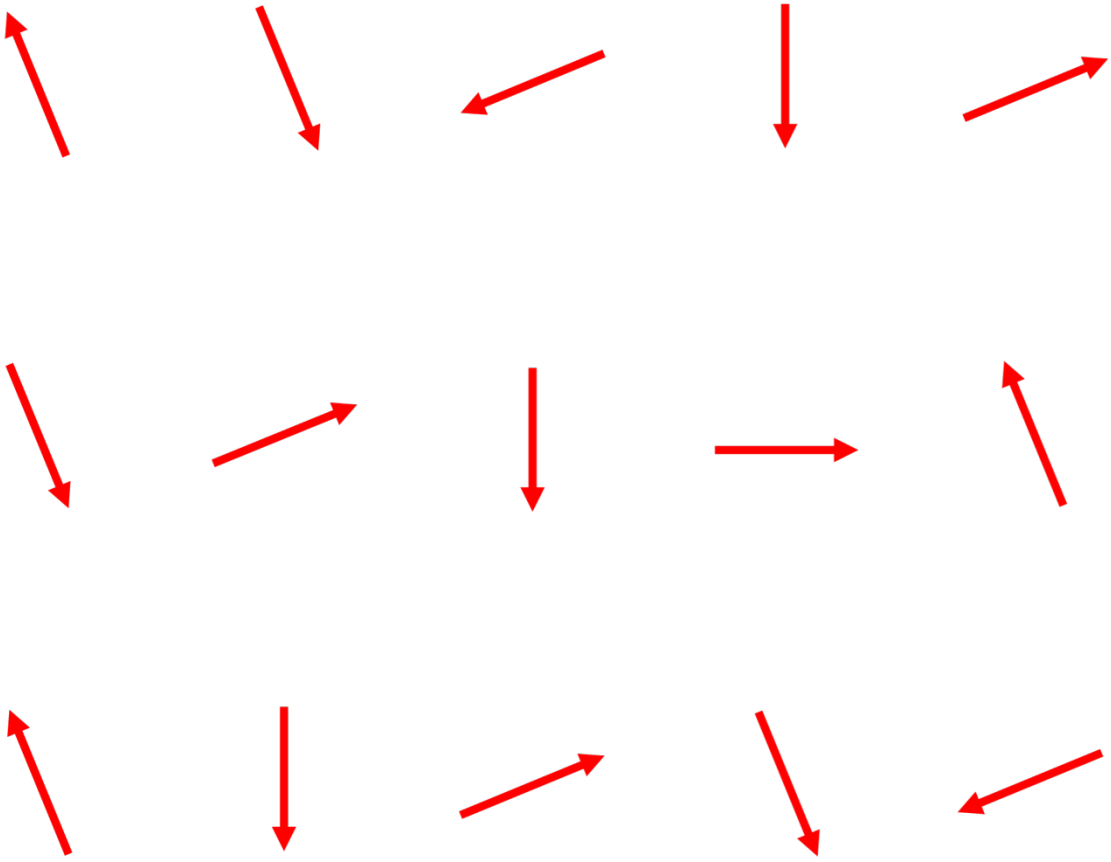




Question 26

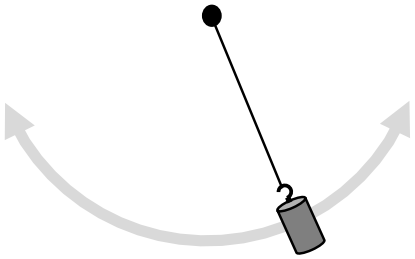
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away from its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

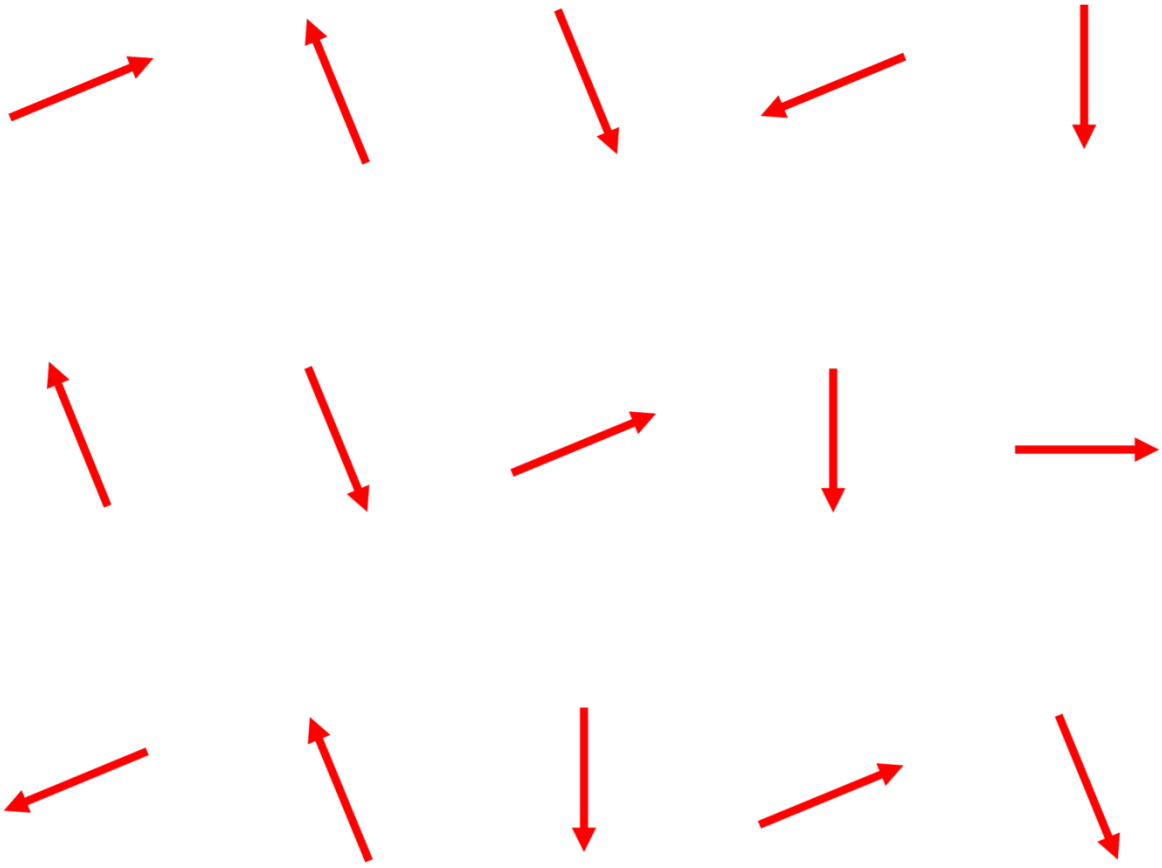




Question 27

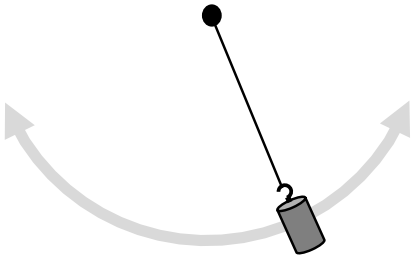
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away from its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

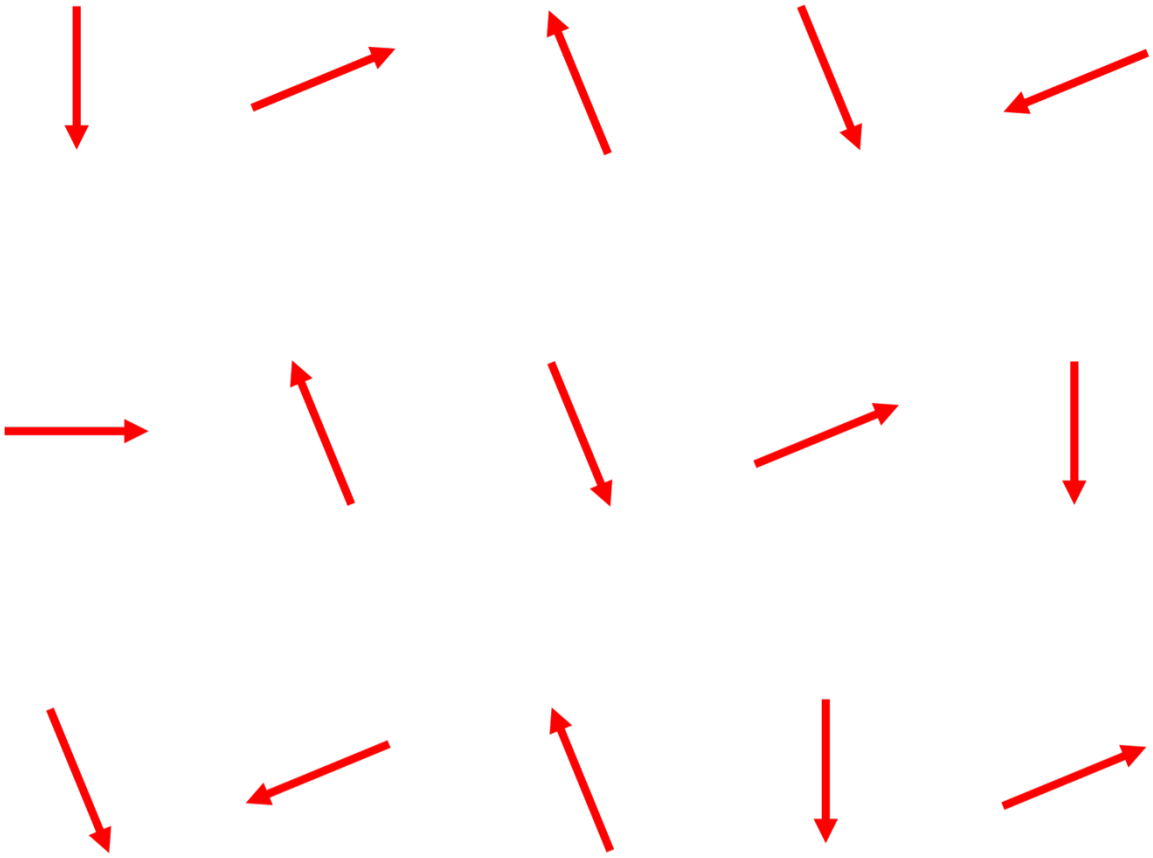




Question 28

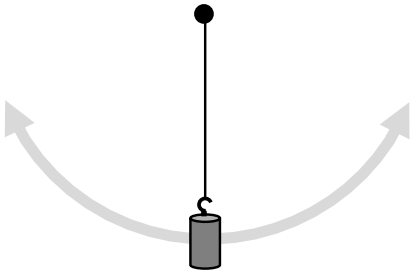
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away from its middle position. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

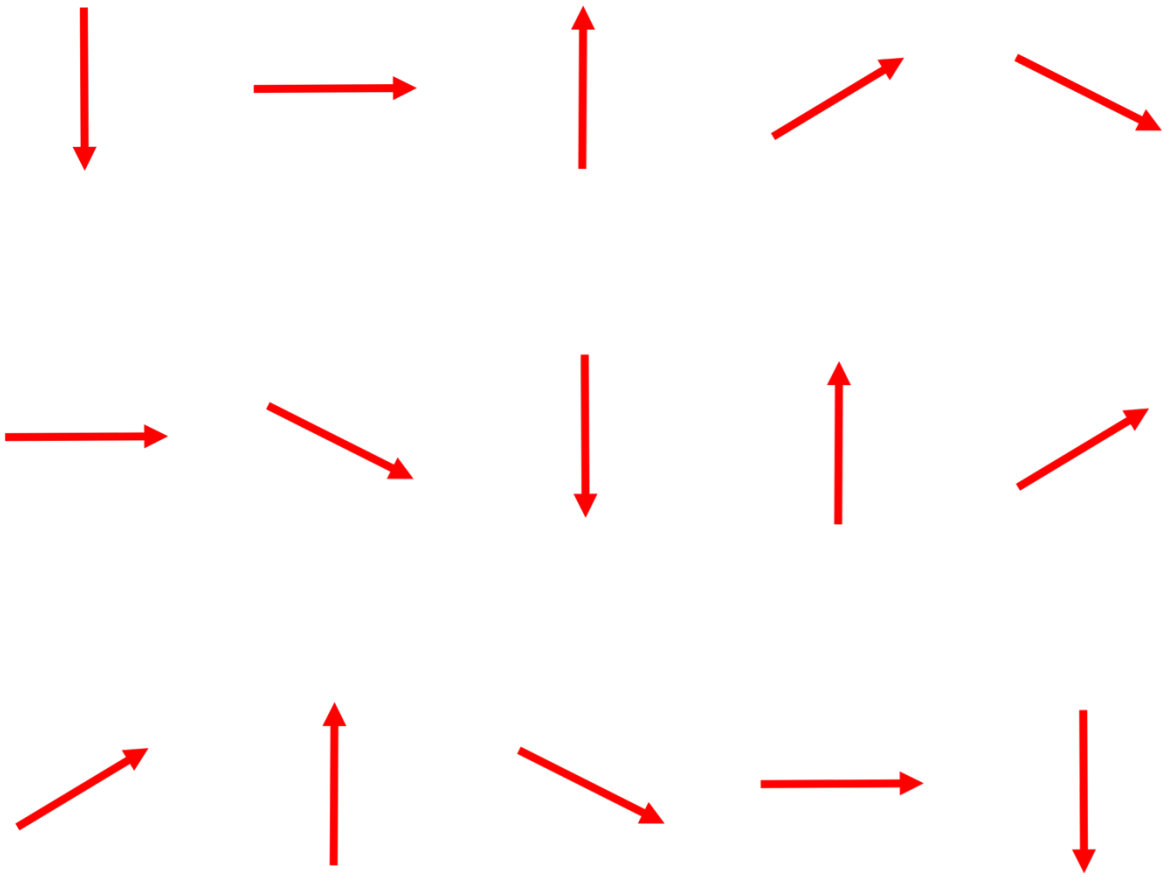




Question Group 8
Question 29

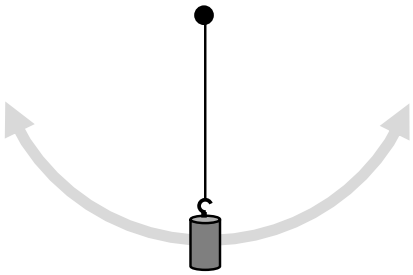
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging towards the right. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

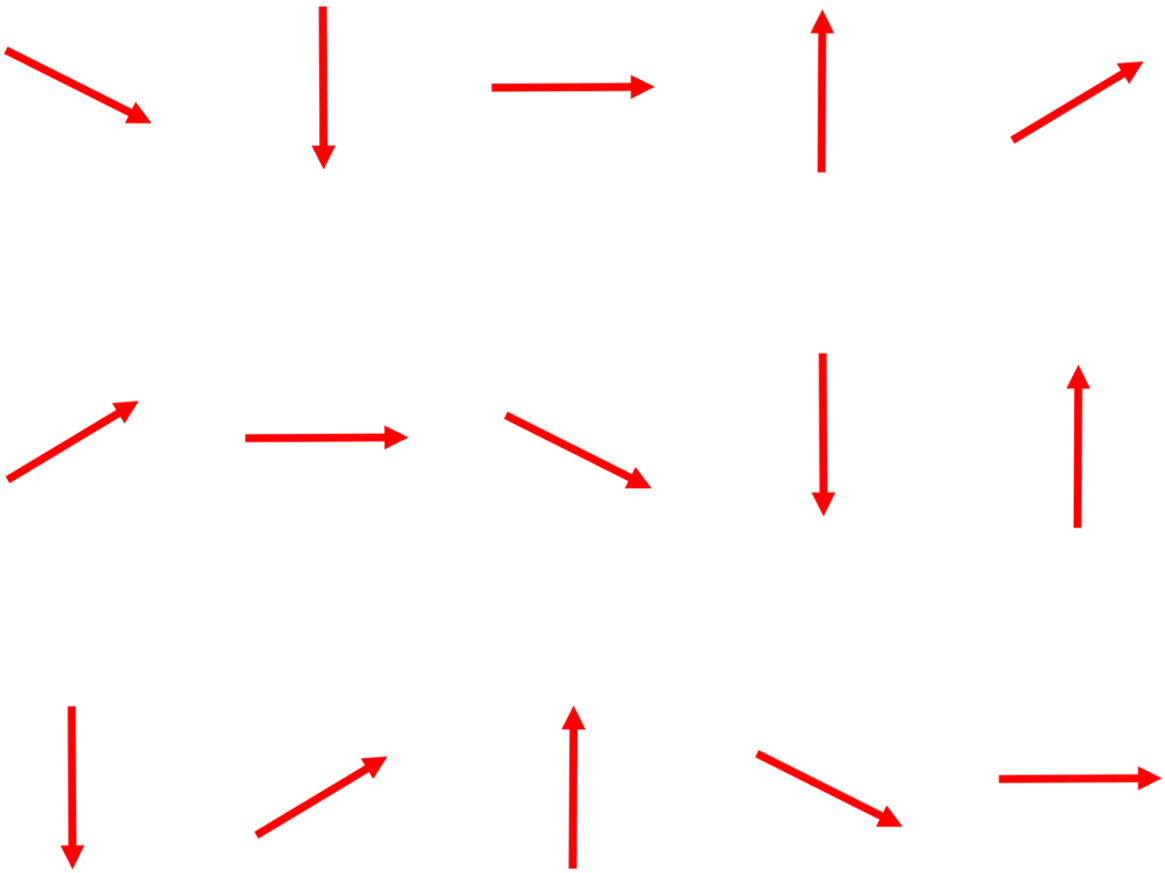




Question 30

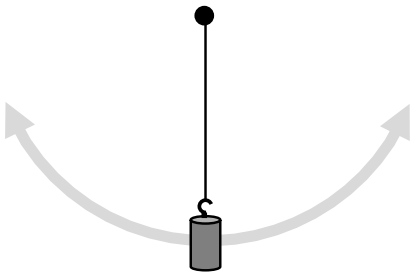
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away towards the right. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

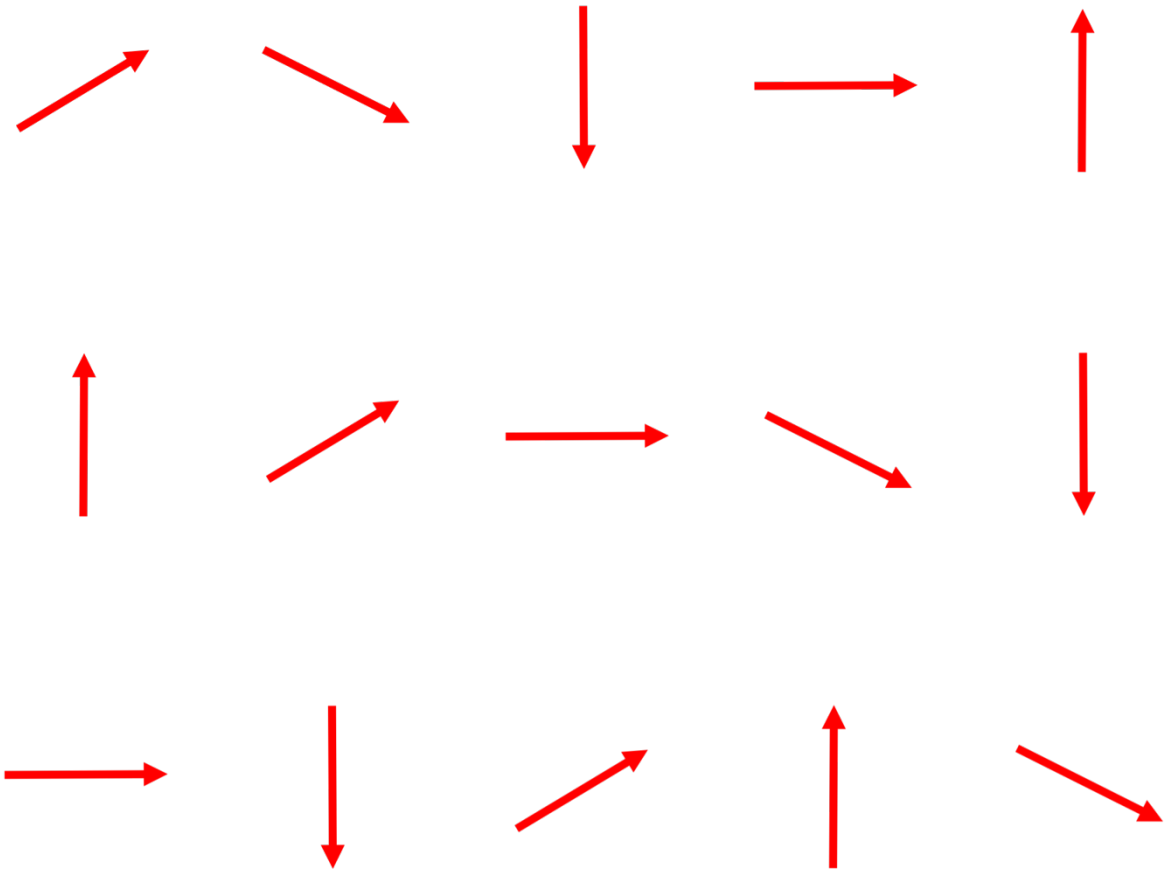




Question 31

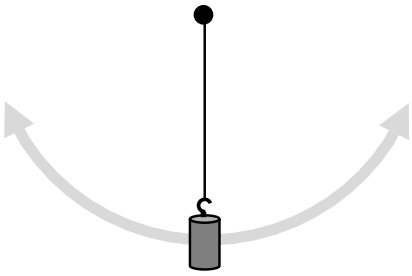
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away towards the left. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

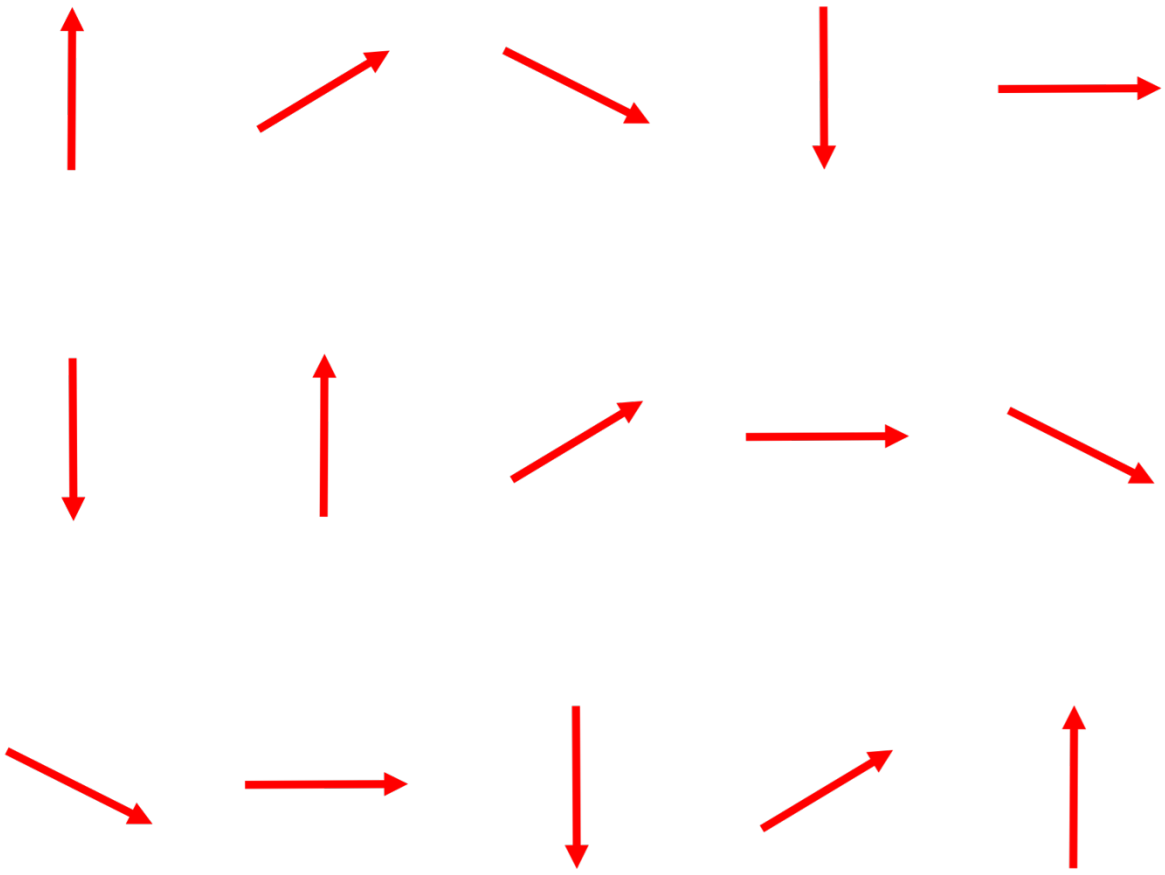




Question 32

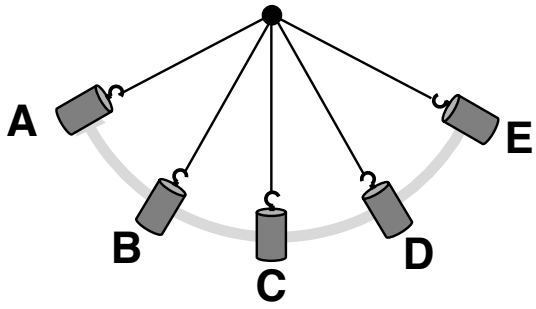
A pendulum is swinging back and forth along its circular arc. At the indicated position, the pendulum is swinging away towards the left. Identify the vector arrow that best represents the velocity, tension force, and gravity force experienced by the pendulum at this location.

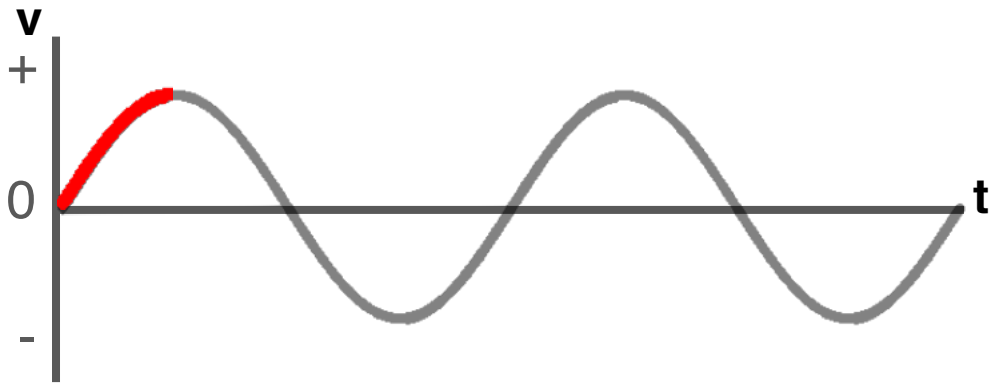




Activity 3: Graphical Analysis
Question Group 9
Question 33

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



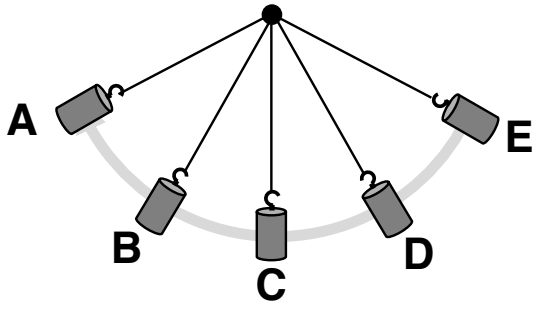


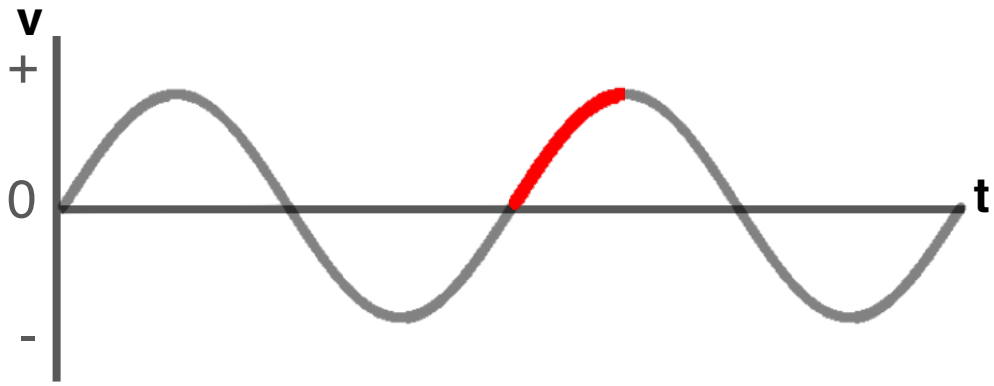
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 34

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



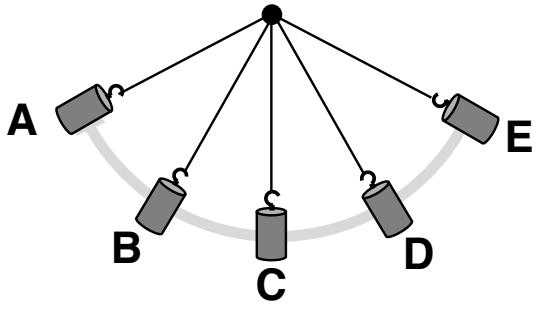


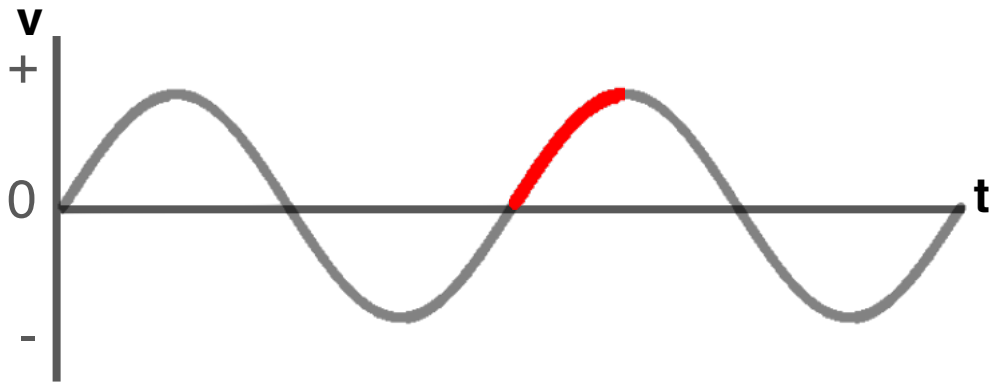
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 35

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



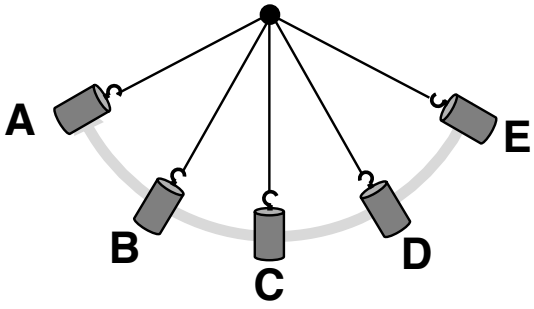


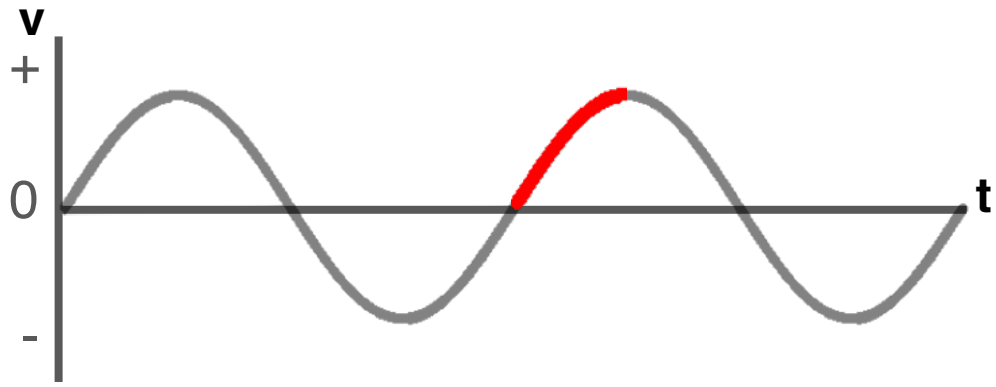
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 36

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



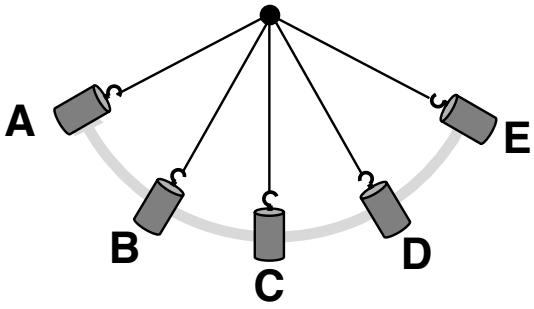


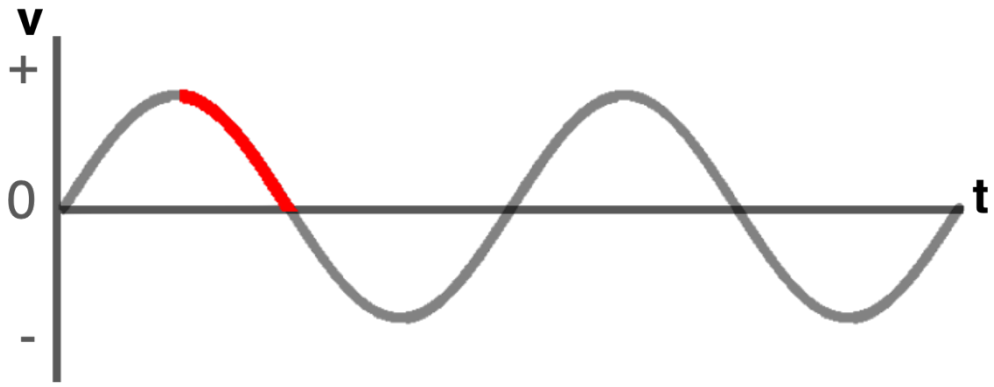
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question Group 10
Question 37

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



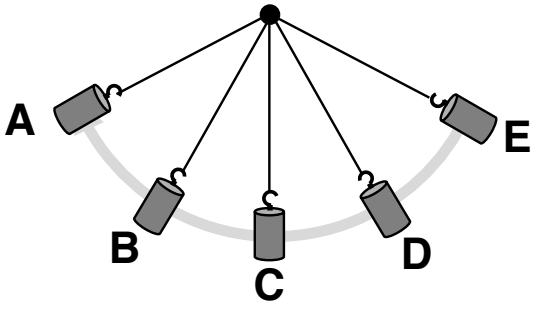


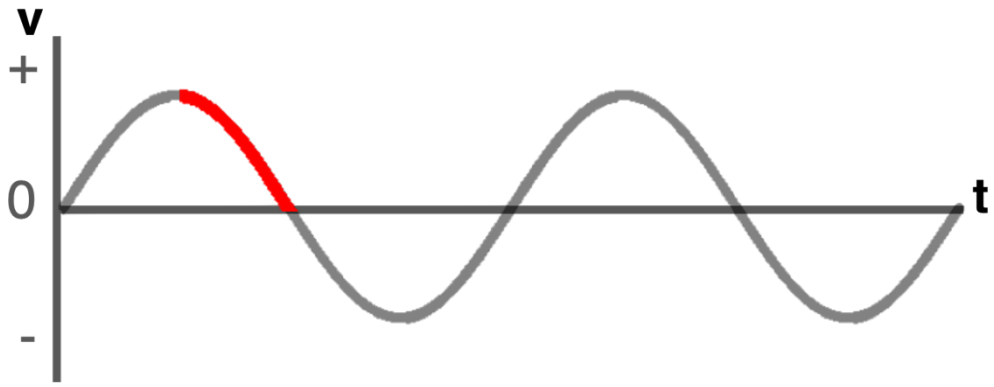
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 38

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



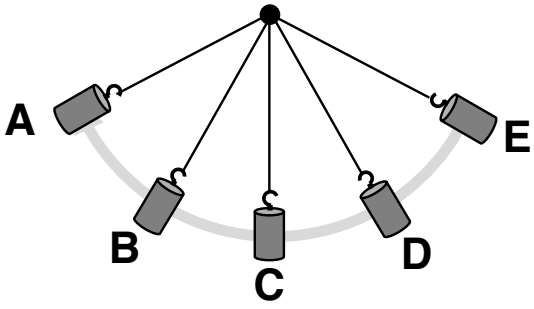


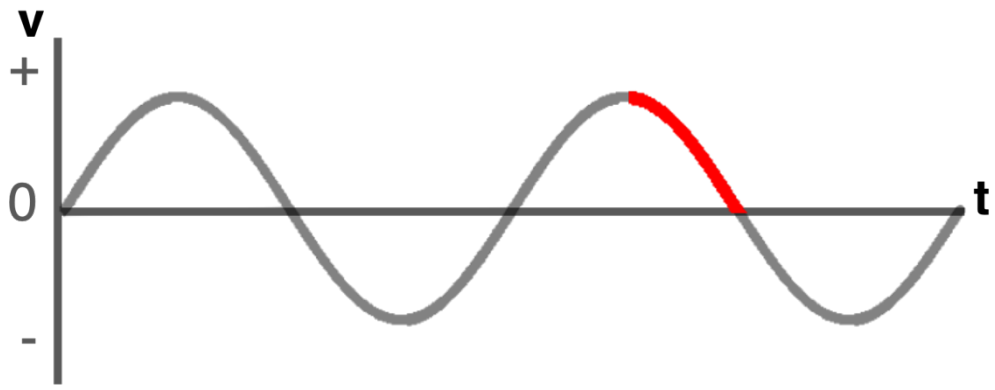
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 39

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



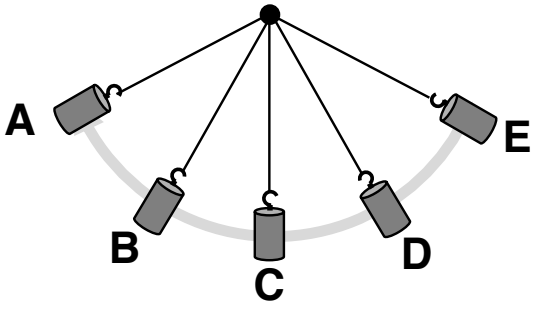


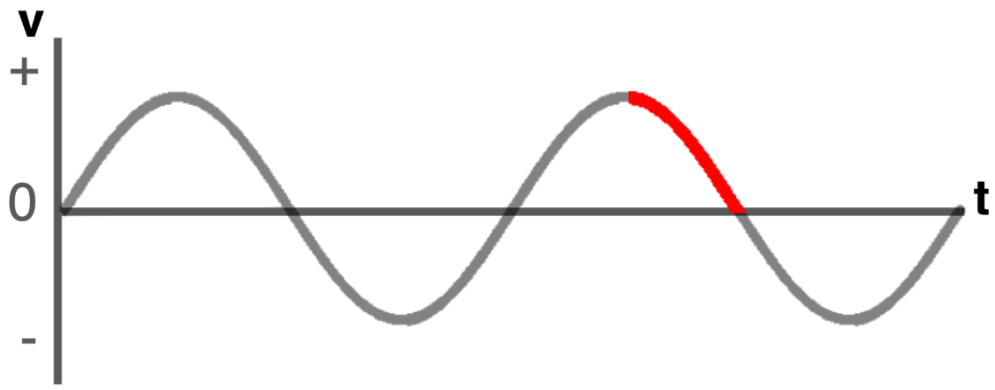
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 40

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



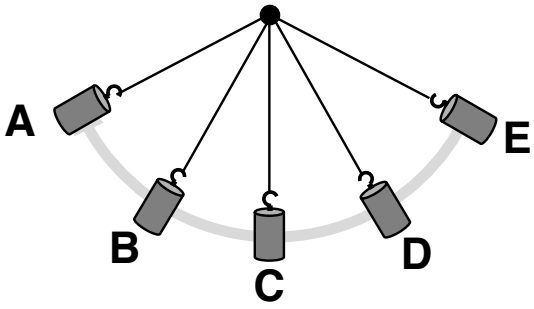


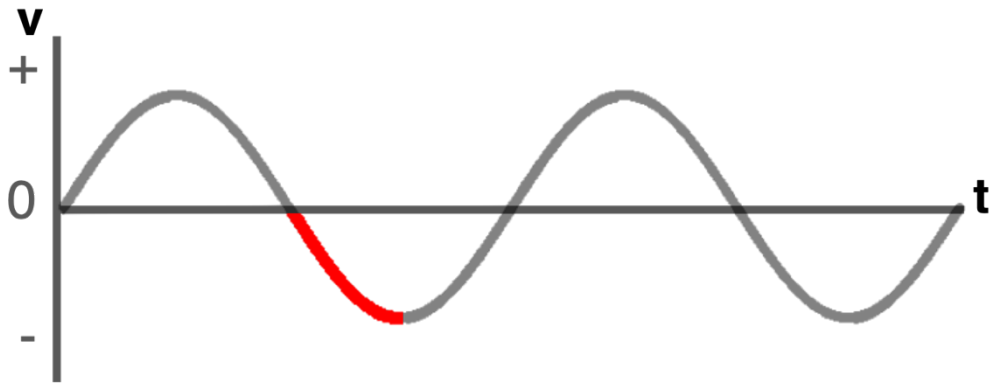
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question Group 11
Question 41

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



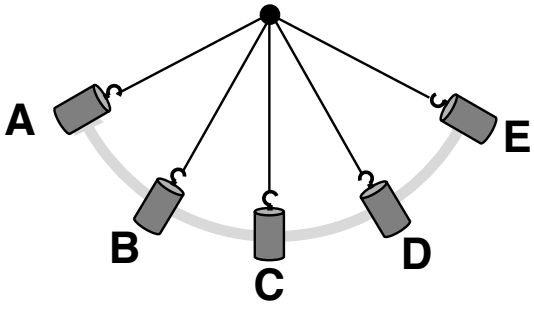


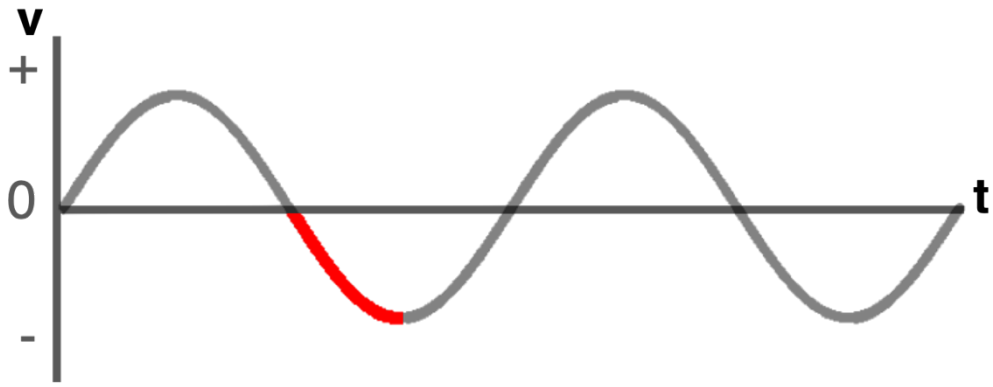
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 42

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



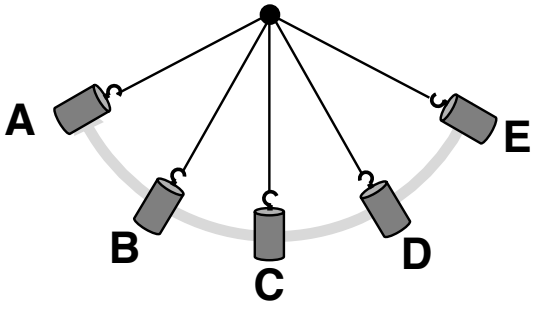


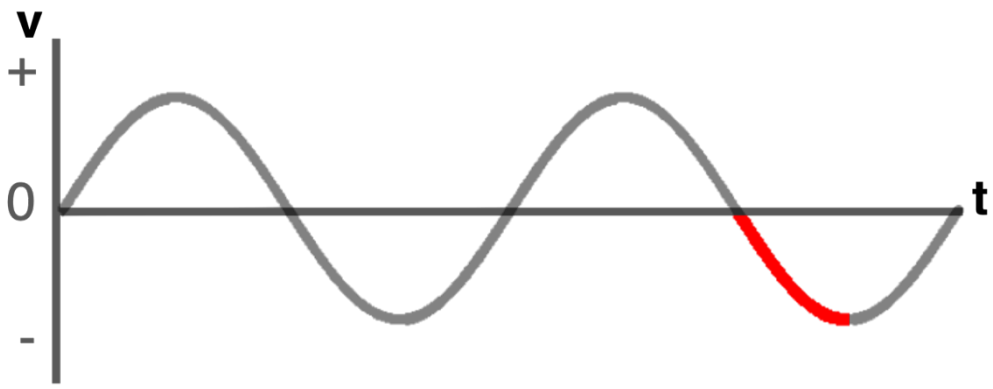
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 43

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



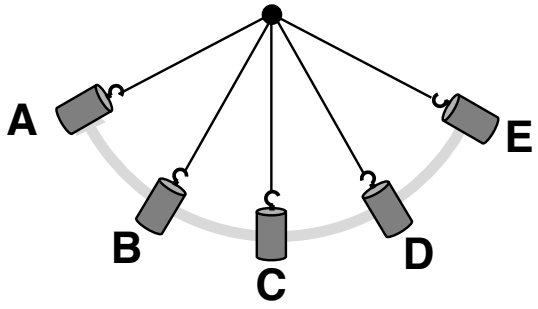


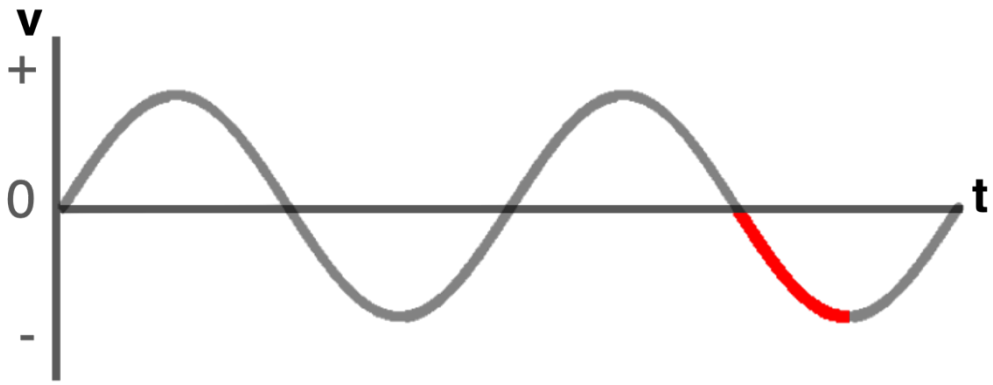
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 44

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



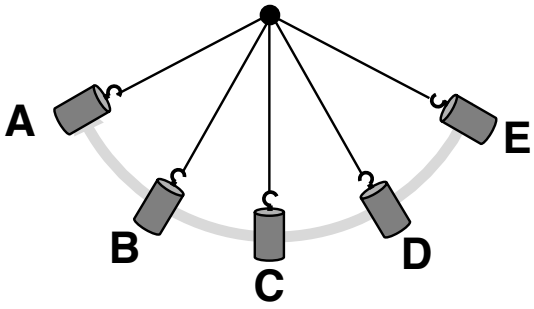


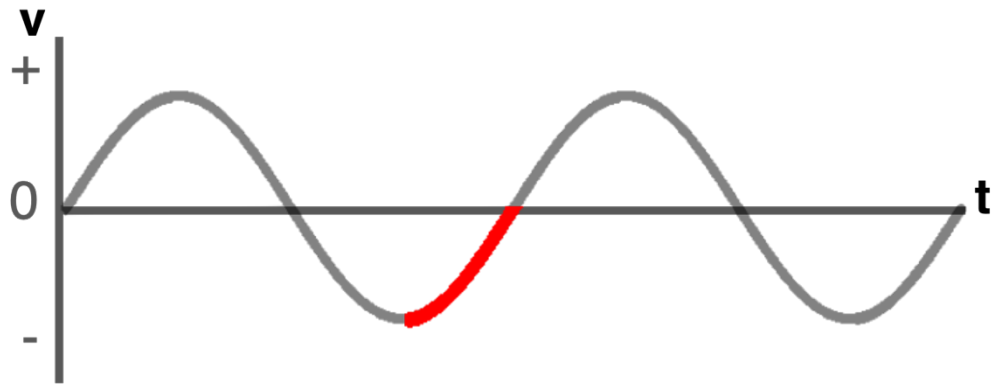
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question Group 12
Question 45

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



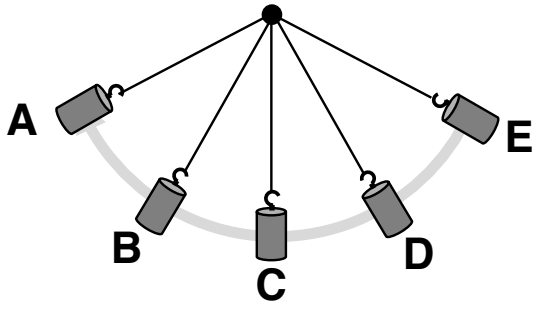


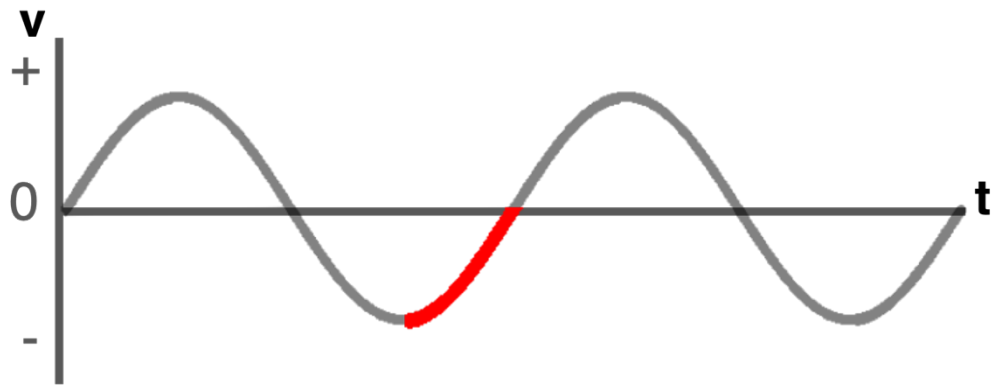
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 46

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



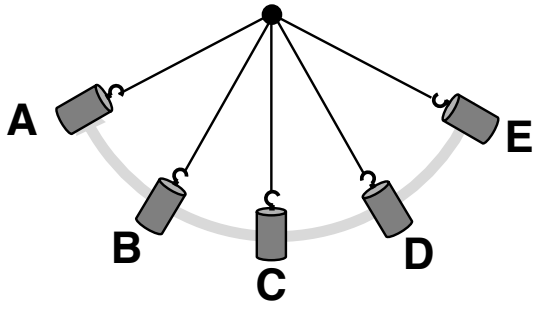


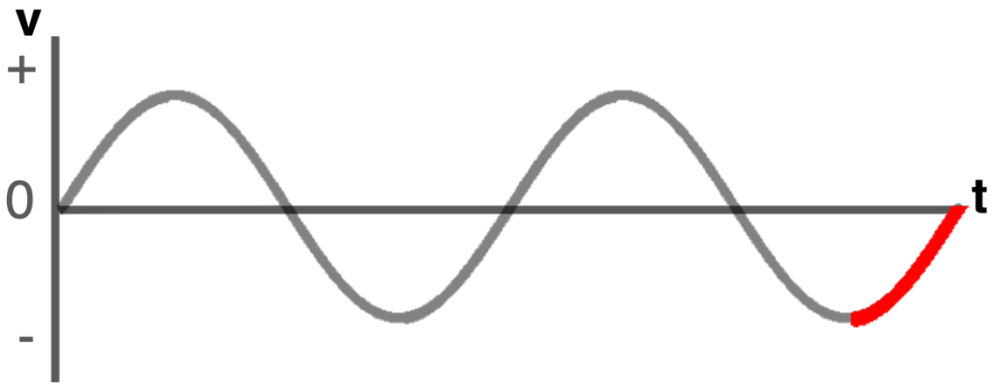
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 47

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



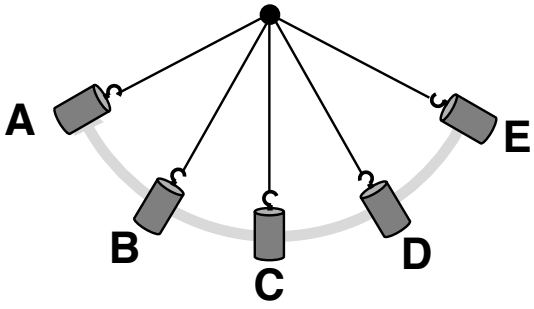


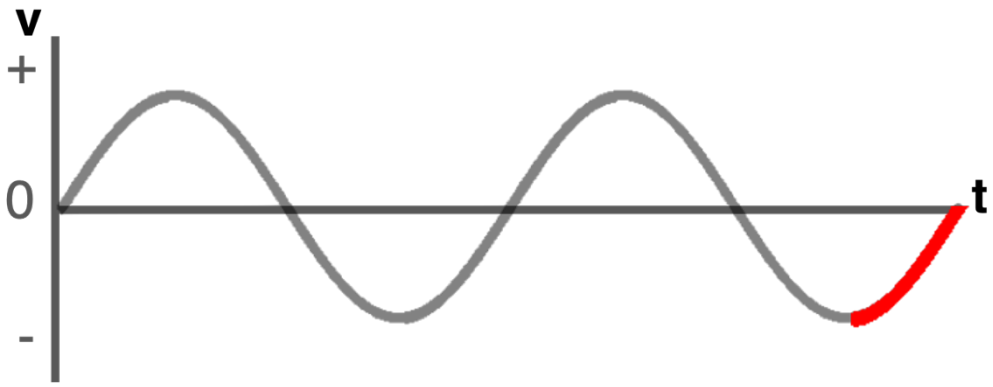
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 48

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



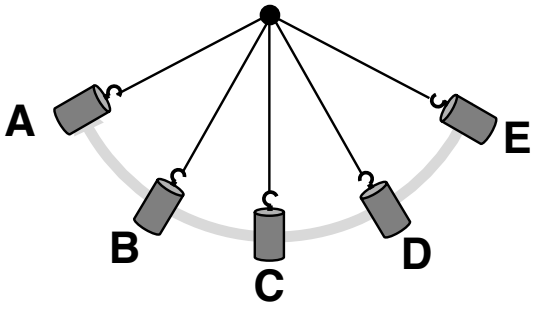


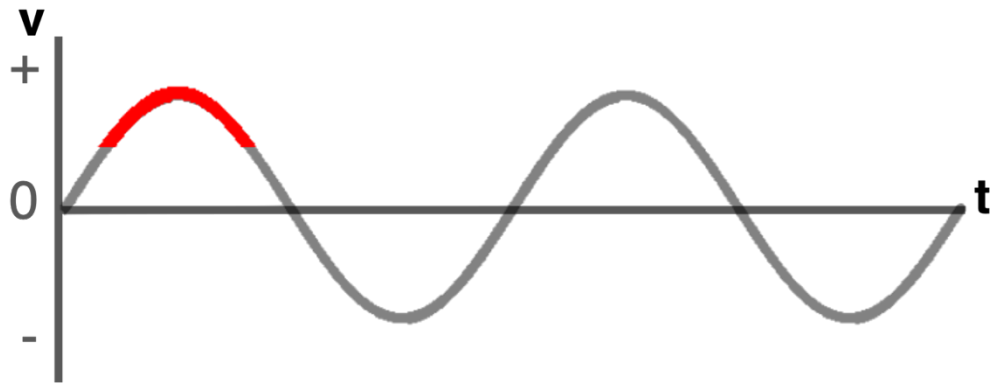
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question Group 13
Question 49

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



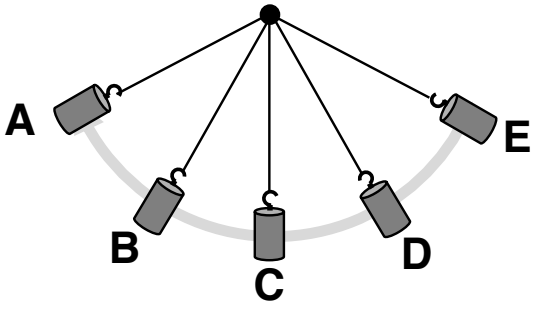


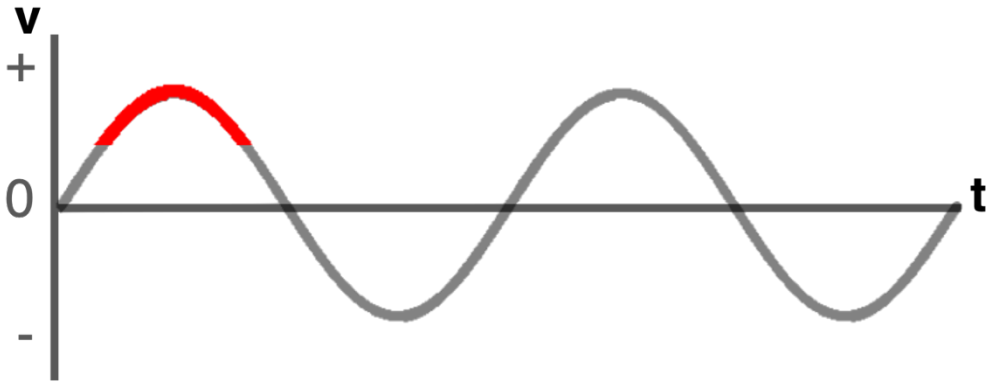
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 50

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



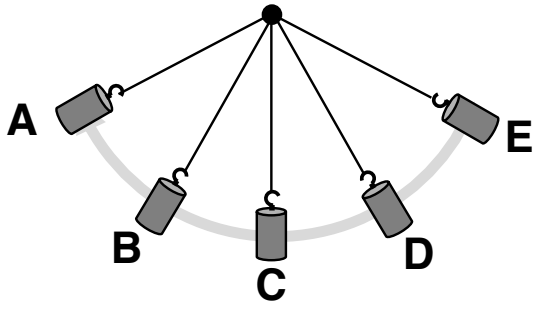


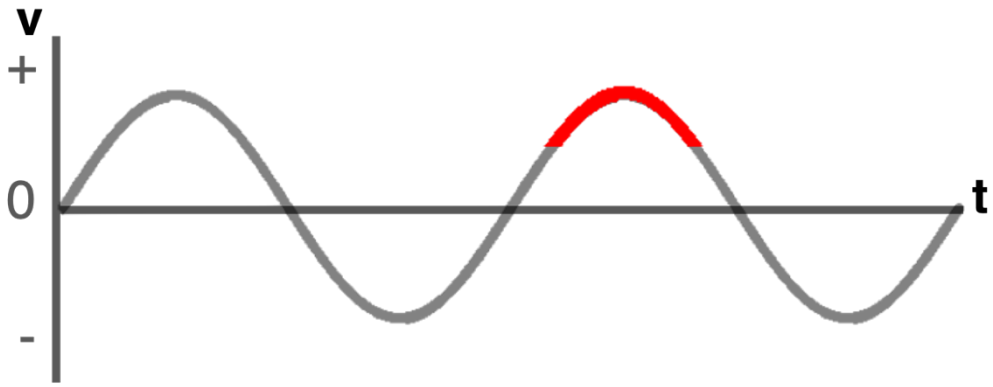
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 51

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



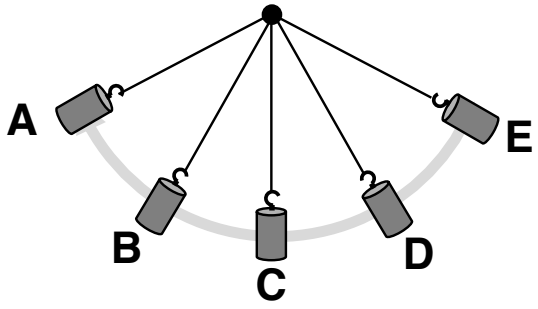


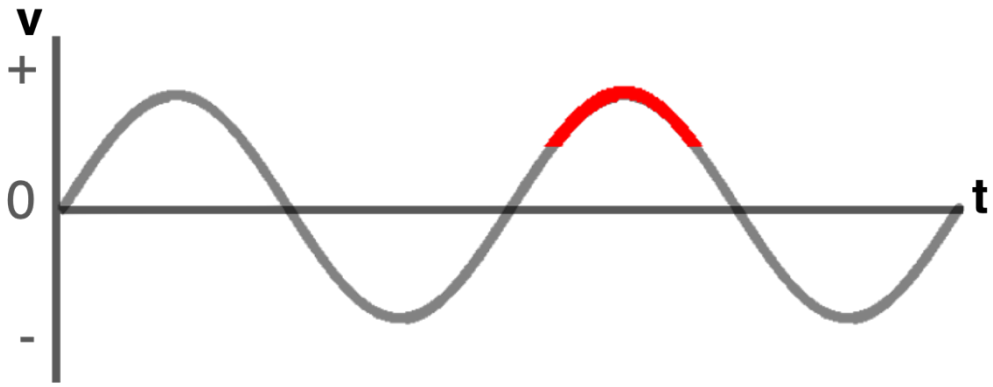
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 52

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



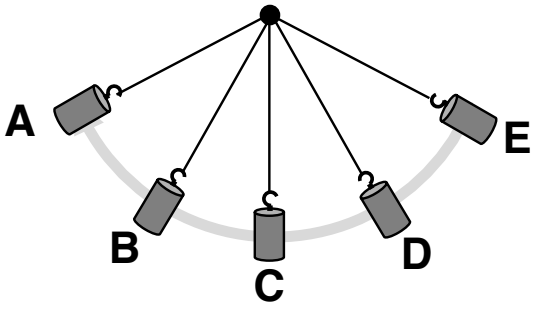


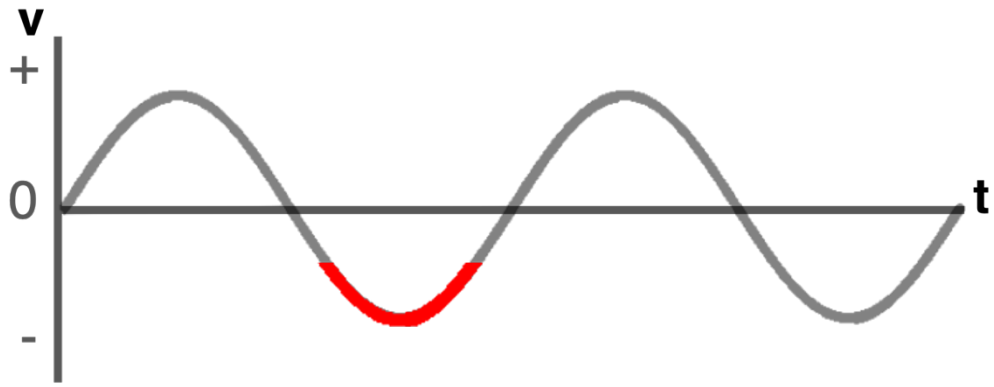
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question Group 14
Question 53

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



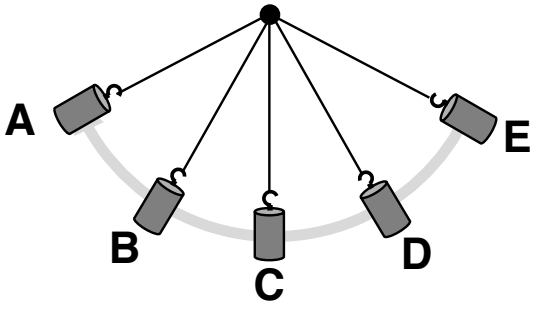


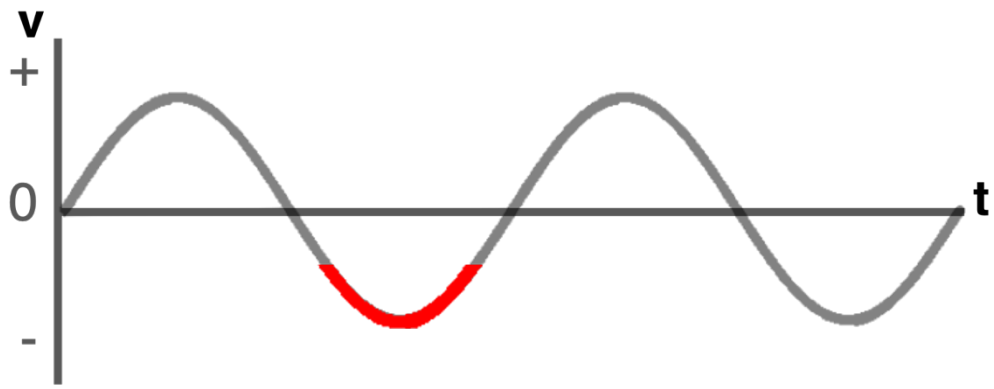
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 54

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



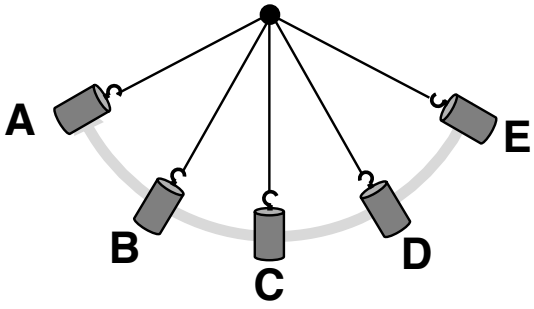


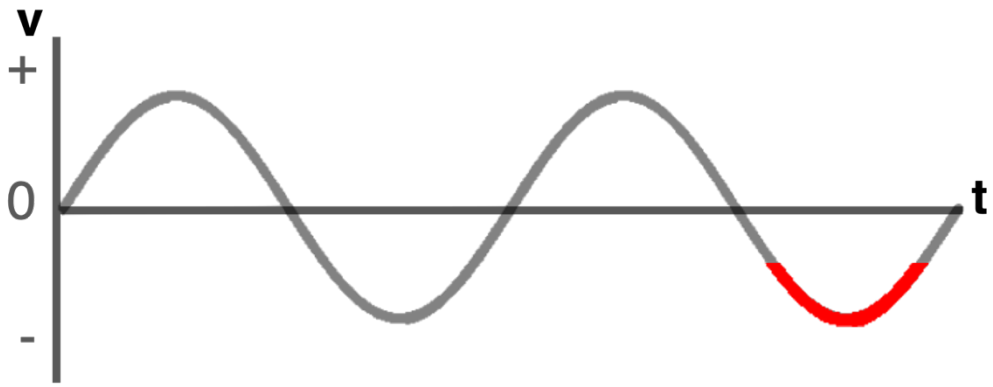
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A

Question 55

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.



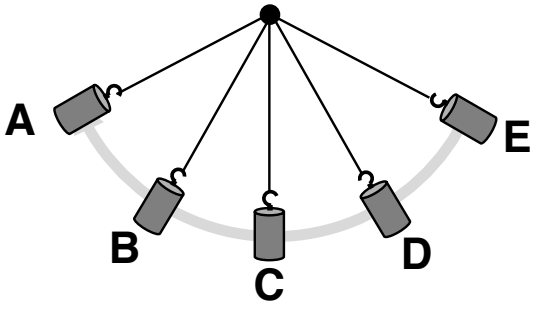


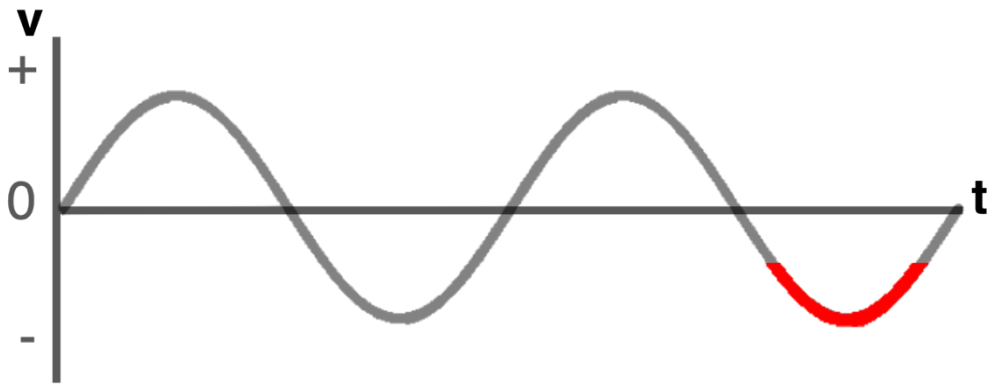
Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	C to B to A	C to D to E
E to D to C	B to C to D	D to C to B

Question 56

A pendulum is swinging back and forth along its circular arc. Five locations along its path are shown. A plot of its velocity as a function of time is shown. A positive velocity represents a pendulum bob moving to the right; a negative velocity represents a leftward motion.





Consider the section of the plot that is shaded red. This section represents the pendulum bob moving from location …

A to B to C	B to C to D	C to D to E
E to D to C	D to C to B	C to B to A