One-Dimensional Kinematics Assessment - Production - Ver. 1

August 3, 2025

1 Kinematics Assessment (KD1-PD-V1)

The questions which follow ask about the motion of an object in one dimension. All objects move along the x-axis. The positive x-axis is to the right of the page. For any vector quantity (acceleration, velocity, etc.), the problem asks about the x-component of the vector.

Problem 1: (KD1-1-V3)
An object is initially at the point $+2\,\text{m}$ along the x-axis. The object then moves to the point $+1\,\text{m}$.

What is the displacement of the object?

A. The displacement is **1 m**.

B. The displacement is **1 m** in the **positive** x-direction.

C. The displacement is **1 m** in the **negative** x-direction.

D. The displacement is **2 m**.

E. The displacement is **2 m** in the **positive** x-direction.

F. The displacement is **2 m** in the **negative** x-direction.

Problem 2: (KD1-10-V7EC)
Object A moves at a rate of $2\,\text{m/s}$ to the north. Object B moves at a rate of $2\,\text{m/s}$ to the south.

Which of the following best describes the speeds and velocities of the objects?

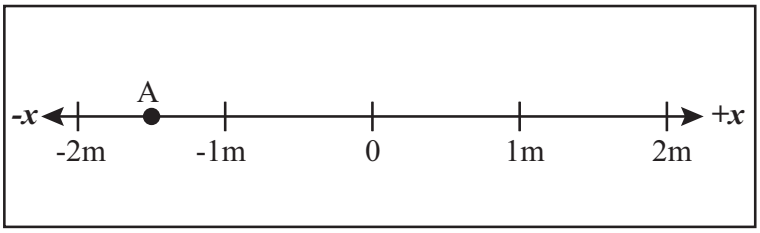
A. Object A and Object B have the **same speed**, and Object A and Object B have the **same velocity**.

B. Object A and Object B have the **same speed**, but Object A and Object B have **different velocities**.

C. Object A and Object B have **different speeds**, but Object A and Object B have the **same velocity**.

D. Object A and Object B have **different speeds**, and Object A and Object B have **different velocities**.

Problem 3: (KD1-8-V5EC)



An object moves along the x-axis. At time $t = 0$, the object is at point A. The object's position is negative at point A as shown in the figure above. The object has a constant negative velocity.

Select the response that best describes the motion of the object after time $t = 0$.

A. The object moves to the **left**.

B. The object moves to the **left** until it **stops** and remains **stationary**.

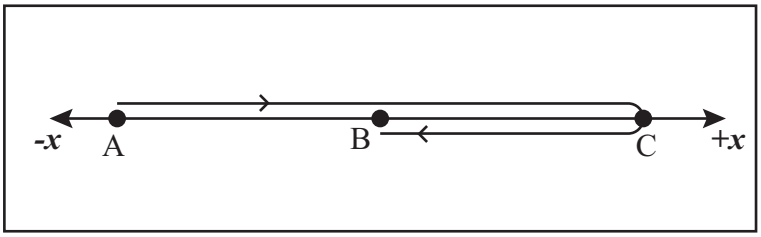
C. The object moves to the **left** until it **stops**, then moves to the **right**.

D. The object moves to the **right**.

E. The object moves to the **right** until it **stops** and remains **stationary**.

F. The object moves to the **right** until it **stops**, then moves to the **left**.

Problem 4: (KD1-11-V7JS)



The figure above shows an object that starts at point A, travels to the right with a constant velocity in the x-direction of $+1\,\text{m/s}$ until it reaches point C, then reverses direction and travels to the left with a constant velocity in the x-direction of $-1\,\text{m/s}$ to point B.

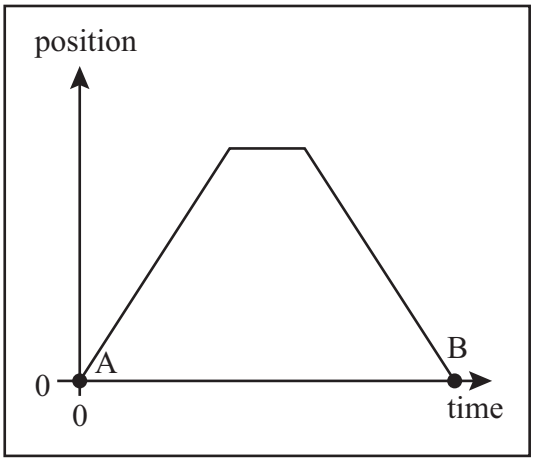
Select the response which best represents the relation of the average speed of the object and the magnitude of the average velocity in the x-direction over the entire motion from A to C and back to B.

A. The average speed and the magnitude of the average velocity are equal.

B. The average speed is greater than the magnitude of the average velocity.

C. The average speed is less than the magnitude of the average velocity.

Problem 5: (KD1-12-V3EC)



The figure above shows the position of an object moving in one dimension as a function of time. The object starts at point A at time $t = 0$.

Select the response below that best describes its motion after time zero.

A. The object first moves in the **positive** direction with **constant** velocity, then **stops** moving, then moves in the **negative** direction with **constant** velocity.

B. The object first moves in the **positive** direction with **constant** velocity, then **stops** moving, then moves in the **positive** direction with **constant** velocity.

C. The object first moves in the **positive** direction with **increasing** velocity, then moves in the **positive** direction with **constant** velocity, then moves in the **negative** direction with **negative** velocity **increasing in magnitude** with time.

Problem 6: (KD1-14-V3)
An object moves along the x-axis. When the object passes through $x = +1\,\text{m}$, the object has a velocity of $+2\,\text{m/s}$ in the positive x-direction. When the object passes through $x = +2\,\text{m}$, the object has a velocity of $+1\,\text{m/s}$ in the positive x-direction.

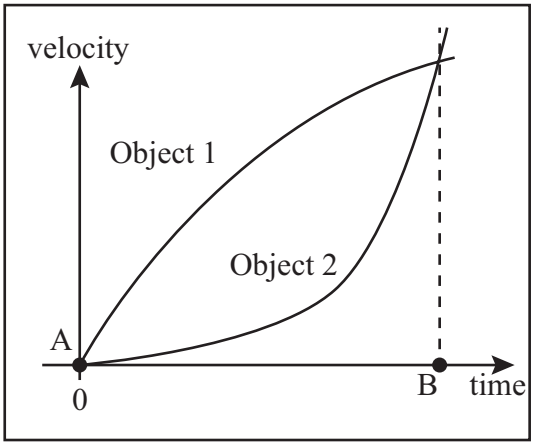
Select the response which best describes the average acceleration of the object between the two points.

A. The object's average acceleration is zero.

B. The object's average acceleration is in the positive x-direction.

C. The object's average acceleration is in the negative x-direction.

Problem 7: (KD1-15-V3EC)



Two objects, Object 1 and 2, move in one dimension. The figure above shows their velocities as a function of time.

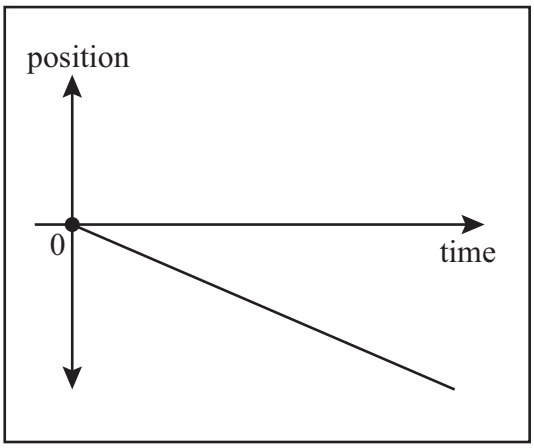
Compare the distance traveled by each object between time $t = A$ and time $t = B$.

A. The distance traveled is the same for both objects.

B. Object 1 travels farther than Object 2.

C. Object 2 travels farther than Object 1.

Problem 8: (KD1-17-V4JS)



The figure above shows the position of an object as a function of time.

Compare the velocity of the object with the acceleration of the object.

A. The velocity and acceleration are **constant**. Both are **greater than zero**.

B. The velocity and acceleration both **decrease in magnitude with time**.

C. The velocity and acceleration are **constant**. Both are **less than zero**.

D. The velocity is **constant and negative** while the acceleration is **constant and positive**.

E. The velocity is **constant and negative** while the acceleration is **zero**.

Problem 9: (KD1-18)
An object moves along the x-axis. The object is at $x = -1\,\text{m}$ on the x axis at time $t = 0$. The object's velocity at time $t = 0$ is positive. The object has a constant positive acceleration in the x direction.

Select the response which best describes the motion of the object at times after $t = 0$.

A. The object moves in the **positive** x-direction with **increasing** speed.

B. The object moves in the **negative** x-direction with **increasing** speed.

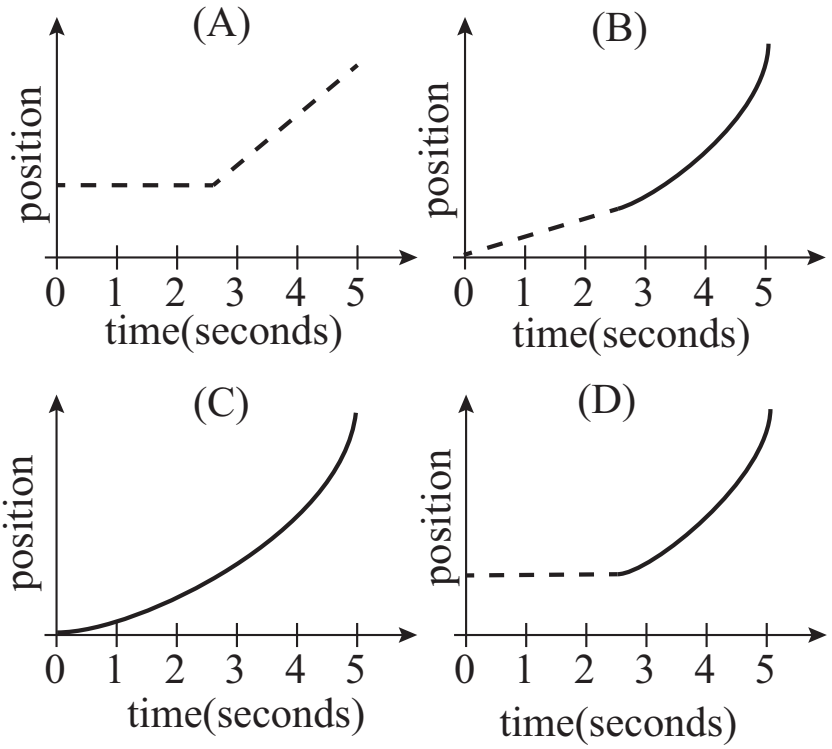
C. The object moves in the **positive** x-direction with **constant** speed.

D. The object moves in the **positive** x-direction with **decreasing** speed until it **stops**. Then it **remains stationary**.

E. The object moves in the **positive** x-direction with **decreasing** speed until it **stops**. Then it travels in the **negative** x-direction with **increasing** speed.

Problem 10: (KD1-48-V2JS)
An object travels with a constant positive velocity for 2.5 seconds. It then travels with a positive acceleration until 5 seconds.

Select the figure below which best represents its position as a function of time. To help read the graphs, straight segments are dashed lines and curved segments are solid lines.



Problem 11: (KD1-19-V4EC)
An object moves in one dimension, along the x-axis. At time $t = 0$, the object is at $x = +1\,\text{m}$ on the x-axis. The object's velocity is positive at time $t = 0$, and the object has constant negative acceleration.

Select the response which best describes the motion of the object, starting at $t = 0$.

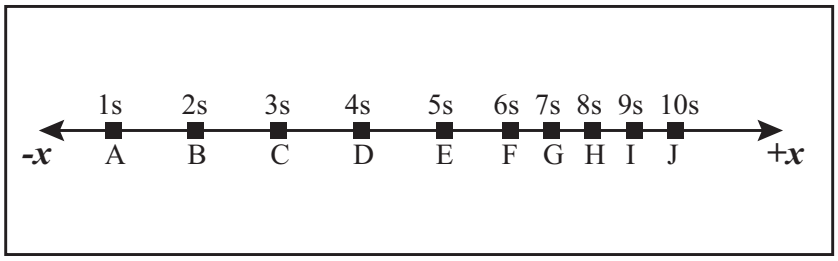
A. The object moves in the **negative** x-direction with **increasing** speed until it eventually **stops**, then travels in the **positive** x-direction with **decreasing** speed.

B. The object moves in the **positive** x-direction with **decreasing** speed until it eventually **stops**, then travels in the **negative** x-direction with **increasing** speed.

C. The object moves in the **positive** x-direction with **decreasing** speed until it eventually **stops**, then continues to travel in the **positive** x-direction with **decreasing** speed.

D. The object moves in the **negative** x-direction with **decreasing** speed until it eventually **stops**, then travels in the **positive** x-direction with **increasing** speed.

Problem 12: (KD1-20-V5JS)



The figure above shows the motion of an object in the positive x- direction. The position of the object is indicated by a set of squares. Each sequential square is one second apart in time.

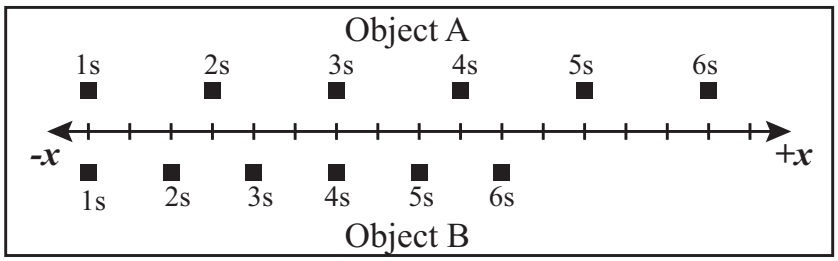
Select the response which describes the average acceleration of the object between point C and point H.

A. The average acceleration is zero.

B. The average acceleration is positive.

C. The average acceleration is negative.

Problem 13: (KD1-23-V4JS)



The figure above shows the position of two objects moving in the positive x-direction. The time interval between each numbered square is one second.

Select the response that best describes the relation of the acceleration of the two objects.

A. The acceleration of **object A** is **greater** than the acceleration of **object B**.

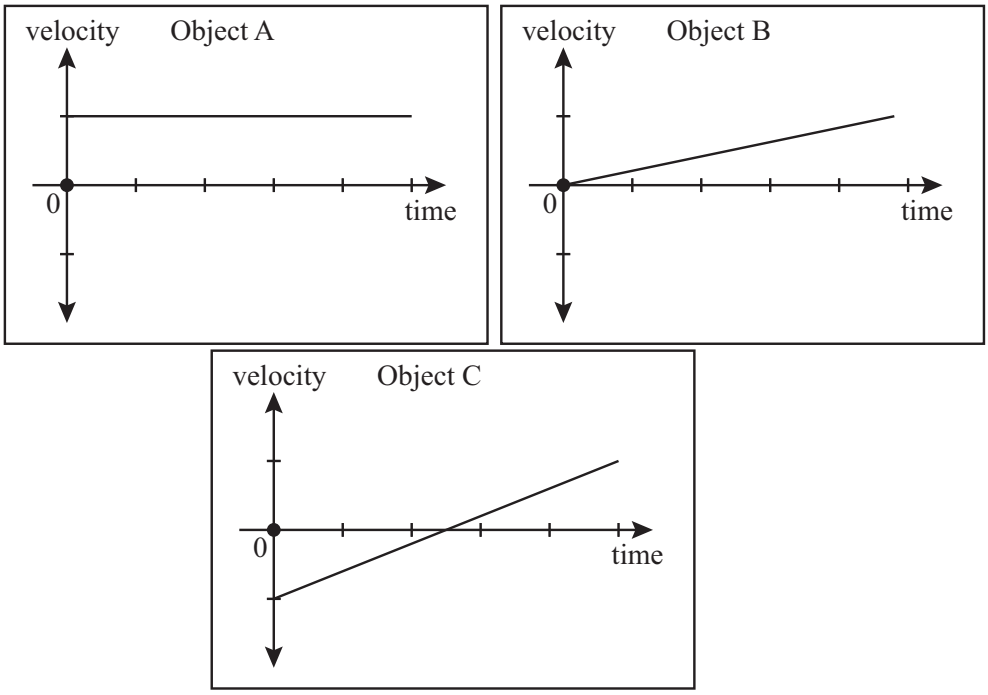
B. The acceleration of objects A and B are **equal**. Both accelerations are **greater than zero**.

C. The acceleration of **object B** is **greater** than the acceleration of **object A**.

D. The acceleration of objects A and B are **equal**. Both accelerations are **zero**.

E. The acceleration of objects A and B are **equal**. Both accelerations are **less than zero**.

Problem 14: (KD1-32-V8EC)



Three objects travel in one dimension. The figures above show the velocity of each object as a function of time. All graphs are plotted on the same scale.

Select the response that best describes the relationship of the displacements of the objects over the entire time shown.

A. $\text{displacement}_\text{A} > \text{displacement}_\text{B} > \text{displacement}_\text{C}$

B. $\text{displacement}_\text{A} = \text{displacement}_\text{B} = \text{displacement}_\text{C}$

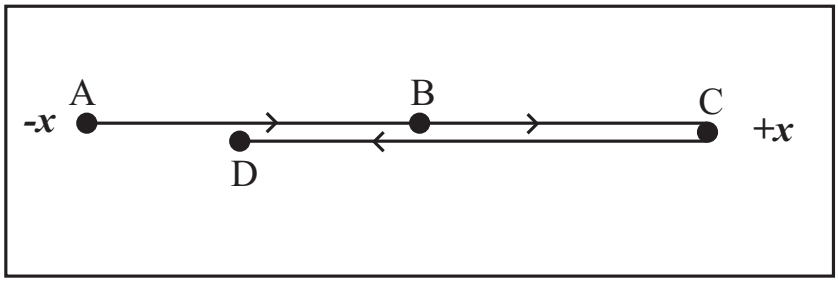
C. $\text{displacement}_\text{A} = \text{displacement}_\text{C} > \text{displacement}_\text{B}$

D. $\text{displacement}_\text{B} > \text{displacement}_\text{A} = \text{displacement}_\text{C}$

E. $\text{displacement}_\text{B} = \text{displacement}_\text{C} > \text{displacement}_\text{A}$

F. $\text{displacement}_\text{C} > \text{displacement}_\text{B} > \text{displacement}_\text{A}$

Problem 15: (KD1-40-V7JS)
The object starts at point A, travels to the right along the x-axis through point B until it reaches point C, then reverses direction and travels to the left through point D. The object travels along the same line both while traveling to the left and to the right. The two paths are separated in the figure to make it easier to read. Neglect air resistance. The four points are shown on the figure below.



Select the response that best describes the object's velocity and acceleration at point C.

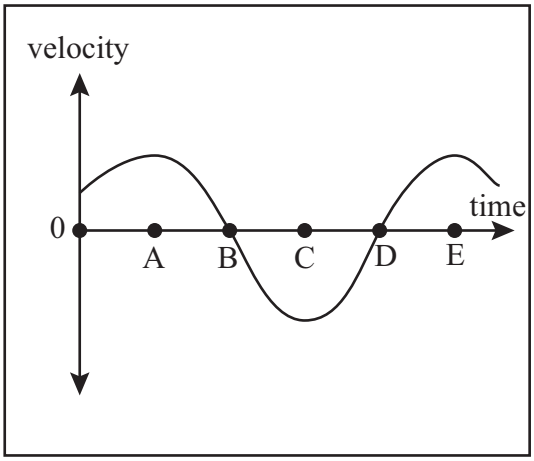
A. The object's velocity in the x-direction is **zero**, and its acceleration in the x-direction is **zero**.

B. The object's velocity in the x-direction is **positive**, and its acceleration in the x-direction is **negative**.

C. The object's velocity in the x-direction is **zero**, and its acceleration in the x-direction is **negative**.

D. The object's velocity in the x-direction is **negative**, and its acceleration in the x-direction is **negative**.

Problem 16: (KD1-38-V8EC)



An object is moving in one dimension. The velocity of the object as a function of time is shown in the figure above.

When does the object change its direction of motion?

A. At times A and E

B. At times B and D

C. At time C

D. At times A, C, and E

E. At times A, B, C, D, and E

Problem 17: (KD1-18-V5EC)
An object moves along the x-axis. At time $t = 0$, the object is at $x = -1\,\text{m}$ on the x-axis. The object's velocity is negative at time $t = 0$, and the object has constant positive acceleration.

Select the response which best describes the motion of the object at $t = 0$.

A. The object moves in the **negative** x-direction with **increasing** speed.

B. The object moves in the **negative** x-direction with **decreasing** speed.

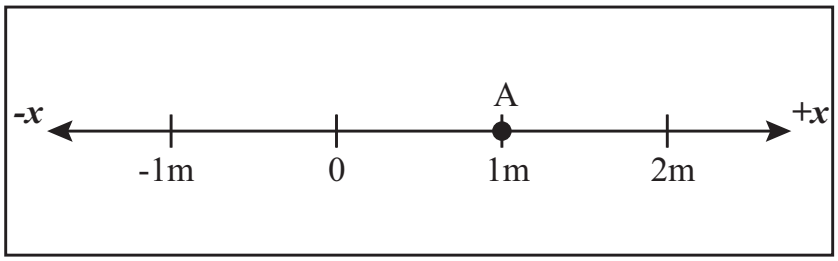
C. The object moves in the **negative** x-direction with **constant** speed.

D. The object moves in the **positive** x-direction with **increasing** speed.

E. The object moves in the **positive** x-direction with **decreasing** speed.

F. The object moves in the **positive** x-direction with **constant** speed.

Problem 18: (KD1-52-V5JS)



An object is constrained to travel on the x-axis. When it is at point A, as shown above, it has acceleration $-2\,\text{m/s}^2$.

Which of the following could be true about the speed of the object when it is at point A?

A. The speed is decreasing.

B. The speed is increasing.

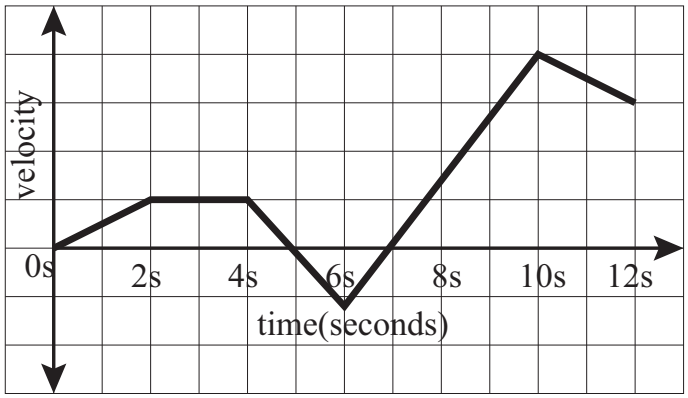
C. The speed is instantaneously zero.

D. Both A and B are possible.

E. Both A and C are possible.

F. A, B, and C are possible.

Problem 19: (KD1-45-V3EC)

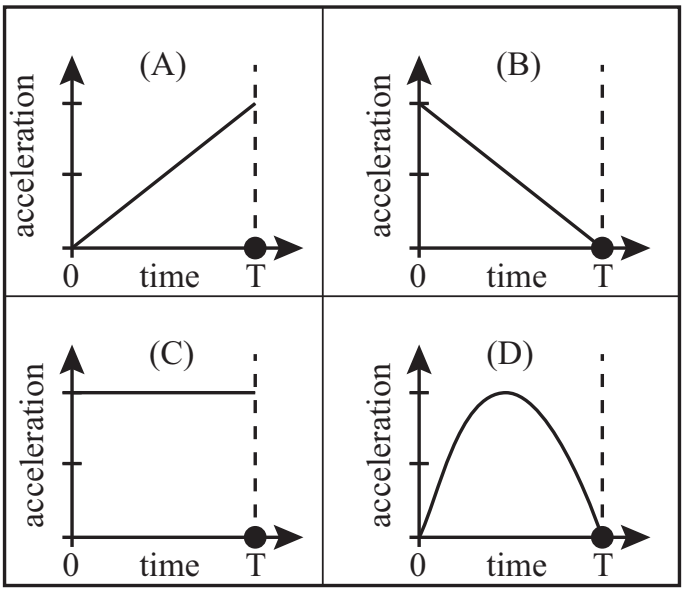


The figure above shows the velocity as a function of time of an object moving in one dimension.

Select the time or times with the greatest negative acceleration.

A. from 4 s to 6 s
B. at 6 s
C. from 5 s to 7 s
D. from 6 s to 10 s
E. at 10 s
F. from 10 s to 12 s

Problem 20: (KD1-43-V8EC)



The figure above shows four graphs of the acceleration as a function of time for an object moving in one dimension. All graphs are plotted on the same scale.

Select the graph where the change in velocity from time $t = 0$ to time $t = T$ is the greatest.

A. Graph A

B. Graph B

C. Graph C

D. Graph D

E. Graphs A and B

2 General Reasoning Assessment

Problem 21: (CR1)
A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball.

How much does the ball cost?

A. 1 cent

B. 5 cents

C. 9 cents

D. 10 cents

Problem 22: (CR2)
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

A. 100 minutes

B. 5 minutes

C. 500 minutes

D. 20 minutes

Problem 23: (CR3)
In a lake, there is a patch of lily pads. Every day, the patch doubles in size.

If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

A. 47 days

B. 24 days

C. 36 days

D. 12 days