Officer Aptitude Rating (OAR) Practice Test (Sample)

Study Guide

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Questions

1. How much pure acid must be added to 10 ounces of a 50% acid solution to obtain a 75% acid solution?

A. 5 ounces

B. 6 ounces

C. 7 ounces

D. 8 ounces

2. What type of simple machine is an axe classified as?

A. A lever

B. A wedge

C. A wheel and axle

D. An inclined plane

3. When both painters work together, how much of the job do they complete per hour if one can do it in twelve hours and the other in eight?

A. 1/24 of the job

B. 1/12 of the job

C. 5/24 of the job

D. 1/5 of the job

4. What is the typical altitude of the stratosphere?

A. 20 miles

B. 10 miles

C. 5 miles

D. 15 miles

5. What is the altitude of a stratus cloud typically measured below?

A. 4,000 feet

B. 5,000 feet

C. 6,000 feet

D. 7,000 feet

6. What is the formula used for solving ratios of areas in relation to a specific example?

A. a^1/d^1 = d^2/a^2

B. a^2/a^1 = d^1/d^2

C. d^1/d^2 = a^1/a^2

D. a^1/a^2 = d^2/d^1

7. What is the total length of the bridge if one bank holds 1/5 and the other holds 1/6 of its length with the river being 1520 feet wide?

A. 2000 feet

B. 2200 feet

C. 2400 feet

D. 2600 feet

8. During a lift using a fixed pulley, what advantage is primarily gained?

A. Change of direction of force

B. Increase in speed

C. Weight reduction

D. Storage of energy

9. What is a primary effect of local magnetism on navigational tools?

A. It increases the aircraft's speed

B. It causes compass deviation

C. It alters the structural integrity of an aircraft

D. It affects the lift produced by the wings

10. What is the unit of measure for electric current?

A. Coulomb

B. Watt

C. Ampere

D. Volt

Answers

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

Explanations

1. How much pure acid must be added to 10 ounces of a 50% acid solution to obtain a 75% acid solution?

A. 5 ounces

B. 6 ounces

C. 7 ounces

D. 8 ounces

To solve the problem, we need to understand the composition of the solutions involved and how to establish the right ratio to achieve the desired concentration of acid in the final mixture. Initially, you have 10 ounces of a 50% acid solution. This means that in this solution, there are 5 ounces of pure acid (50% of 10 ounces) and 5 ounces of other components (the solvent, typically water). When we add a certain amount of pure acid to this solution, we will increase both the total amount of acid and the total volume of the solution. Let's denote the amount of pure acid to be added as x ounces. After adding x ounces of pure acid, the total amount of pure acid becomes $5 + x$ ounces, and the total volume of the new solution becomes $10 + x$ ounces. To achieve a 75% acid solution, we need the equation that represents this concentration: $$\frac{5 + x}{10 + x} = 0.75$$ By cross-multiplying to eliminate the fraction: $$5 + x = 0.75(10 + x)$$ Expanding the

2. What type of simple machine is an axe classified as?

A. A lever

B. A wedge

C. A wheel and axle

D. An inclined plane

An axe is classified as a wedge because its primary function is to split or cut materials. A wedge is a type of simple machine that converts a force applied at an angle into a forward motion, allowing it to separate objects or materials. When you swing an axe downward, the sharp edge of the blade creates a narrow, pointed section that enters the material (such as wood), effectively forcing the fibers apart and allowing the axe to cut through. The design of the axe enables it to exert a large amount of force over a relatively small area, making it highly effective for its intended purpose. In contrast, while a lever, wheel and axle, and inclined plane are also simple machines, they operate under different principles. A lever involves a fulcrum and a beam, a wheel and axle functions to change the direction of force, and an inclined plane allows objects to be lifted with less force by distributing weight over a longer distance. None of these classifications accurately capture the cutting action of an axe as effectively as the wedge does.

3. When both painters work together, how much of the job do they complete per hour if one can do it in twelve hours and the other in eight?

A. 1/24 of the job

B. 1/12 of the job

C. 5/24 of the job

D. 1/5 of the job

To determine how much of the job the two painters can complete together in one hour, we first need to calculate their individual work rates. The first painter can complete the entire job in twelve hours, which means their rate of work is 1/12 of the job per hour. This comes from taking the whole job (1) and dividing it by the time (12 hours); thus, their contribution per hour is 1/12. The second painter can finish the job in eight hours, giving them a work rate of 1/8 of the job per hour, as this is derived by dividing the whole job (1) by the time taken (8 hours). Now, to find out how much they can complete together in an hour, we add their individual rates: 1/12 (first painter) + 1/8 (second painter) To perform this addition, we need a common denominator. The least common multiple of 12 and 8 is 24. Now, we convert each fraction: 1/12 = 2/24 (by multiplying numerator and denominator by 2) 1/8 = 3/24 (by multiplying numerator and denominator by 3) Adding the two together: 2/24 +

4. What is the typical altitude of the stratosphere?

A. 20 miles

B. 10 miles

C. 5 miles

D. 15 miles

The stratosphere is the second layer of Earth's atmosphere, located above the troposphere and below the mesosphere. The typical altitude of the stratosphere extends from about 5 miles (approximately 8 kilometers) to about 30 miles (approximately 50 kilometers) above sea level. Therefore, the correct choice indicating a typical altitude associated with the stratosphere is indeed 20 miles. While the lower boundary of the stratosphere begins around 5 miles, the highlighted choice aligns with the upper range of this atmospheric layer, which is recognized for its relatively stable air and the presence of the ozone layer, essential for absorbing harmful ultraviolet radiation from the sun. This stability contributes to fewer Weather disturbances occurring in the stratosphere compared to the troposphere, which lies below it.

5. What is the altitude of a stratus cloud typically measured below?

A. 4,000 feet

B. 5,000 feet

C. 6,000 feet

D. 7,000 feet

Stratus clouds are typically low-altitude clouds that form in uniform layers and can cover the sky in a gray overcast. The altitude of stratus clouds is generally measured at heights below approximately 6,500 feet (2,000 meters), with most stratus clouds forming at altitudes between 600 to 4,000 feet. The reason why 6,000 feet is the most relevant answer in the context of this question is that it represents a threshold commonly used in meteorology to define the upper limits of what is classified as a stratus cloud. Clouds that exist above this altitude, especially those forming higher than 6,000 feet, would typically belong to other cloud types, such as altostratus or cirrostratus. Understanding the altitude range of stratus clouds is essential since it informs pilots and meteorologists about potential weather conditions, such as low visibility or overcast skies, impacting aviation and safety decisions.

6. What is the formula used for solving ratios of areas in relation to a specific example?

A. a^1/d^1 = d^2/a^2

B. a^2/a^1 = d^1/d^2

C. d^1/d^2 = a^1/a^2

D. a^1/a^2 = d^2/d^1

The chosen answer correctly represents the relationship of area ratios in the context of similar figures. When considering the areas of two similar shapes, the ratio of their areas (let's denote the areas as \(A_1\) and \(A_2\)) is proportional to the square of the ratio of their corresponding linear dimensions (denoted as \(d_1\) and \(d_2\)). Thus, the formula is expressed as: \[\frac{A_1}{A_2} = \left(\frac{d_1}{d_2}\right)^2. \] In this case, using the notation provided, the \(d^1/d^2\) term represents the ratio of the dimensions of the shapes, while \(a^1/a^2\) corresponds to the ratio of the areas. The squared term reflects the fundamental property of geometry that when the dimensions are scaled by a certain factor, the areas are scaled by the square of that factor. This principle is essential in various applications, especially in geometry and proportional reasoning, where understanding the relationship between linear measurements and area calculations is necessary. In summary, the correctness of the selected formula stems from its accurate portrayal of the mathematical relationship between the ratios

7. What is the total length of the bridge if one bank holds 1/5 and the other holds 1/6 of its length with the river being 1520 feet wide?

A. 2000 feet

B. 2200 feet

C. 2400 feet

D. 2600 feet

To determine the total length of the bridge, we can represent the length of the bridge as L. According to the information given, one bank holds 1/5 of the bridge's length, and the other bank holds 1/6 of the bridge's length. Therefore, the lengths held by the banks can be expressed mathematically as: Length held by the first bank = $\frac{1}{5}L$ Length held by the second bank = $\frac{1}{6}L$ To find the total length of the bridge, we need to add the lengths held by both banks and the part of the bridge that spans the river. The width of the river is given as 1520 feet, representing the central portion of the bridge. We can establish the equation: $$\frac{1}{5}L + \frac{1}{6}L + 1520 = L$$ Next, to solve for L, we need a common denominator for the fractions, which is 30. Thus, we can convert the fractions: $$\frac{1}{5}L = \frac{6}{30}L \quad \text{and} \quad \frac{$$

8. During a lift using a fixed pulley, what advantage is primarily gained?

A. Change of direction of force

B. Increase in speed

C. Weight reduction

D. Storage of energy

In a lift involving a fixed pulley, the primary advantage gained is the change of direction of force. The fixed pulley allows the user to pull down on the rope, which in turn lifts the load upwards. This means that instead of having to lift the weight directly upwards, the user can exert force downwards, which is often more convenient and may align better with the user's biomechanics. While other options such as an increase in speed or weight reduction might be associated with different pulley configurations or types of machinery, a fixed pulley does not inherently provide a mechanical advantage in terms of speed or weight. Similarly, storage of energy is not a function of the fixed pulley setup. The main purpose of the fixed pulley is to facilitate the lifting process through a change in direction, making it easier for individuals to manage the load they are lifting.

9. What is a primary effect of local magnetism on navigational tools?

A. It increases the aircraft's speed

B. It causes compass deviation

C. It alters the structural integrity of an aircraft

D. It affects the lift produced by the wings

Local magnetism has a significant effect on navigational tools, particularly compasses. This phenomenon is known as compass deviation. Compass deviation occurs when the magnetic field from nearby objects, such as electronic equipment or metal structures, interferes with the Earth's magnetic field, causing the compass to provide inaccurate readings. This misalignment can lead to navigational errors, which is critical for pilots and navigators to understand and address to maintain accurate course navigation. Understanding this effect is essential for those in aviation and maritime operations to ensure safety and precision in navigation. In contrast, the other options do not relate directly to the impact of local magnetism on compasses. For example, the speed of the aircraft, structural integrity, and lift produced by the wings are influenced by different factors, such as aerodynamics and aircraft design, rather than local magnetic fields.

10. What is the unit of measure for electric current?

A. Coulomb

B. Watt

C. Ampere

D. Volt

The unit of measure for electric current is the Ampere, often abbreviated as 'A.' The Ampere is defined as the flow of electric charge through a conductor and represents the amount of charge passing a point in a circuit per unit time. Specifically, one Ampere is equivalent to one Coulomb of charge moving past a given point in one second. This fundamental concept is critical in understanding electrical circuits, as current is a key parameter that influences the behavior and performance of electrical systems. The other options refer to different electrical concepts: Coulombs measure electrical charge, Watts measure electrical power (the rate at which work is done or energy is transferred), and Volts measure electrical potential difference or voltage. Hence, the Ampere stands out as the correct choice for measuring electric current.