

VITEEE 2025 – 22 April (Shift 1) Question Paper with Solutions

Time Allowed :2 Hours 30 Minutes	Maximum Marks :125	Total Questions :125
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General Instructions

1. Candidates must carry a printed copy of their **VITEEE 2025 Admit Card** and a valid **Photo ID proof** to the examination center.
2. The examination will be conducted in **Computer-Based Test (CBT)** mode.
3. Duration of the examination is **2 hours 30 minutes**.
4. The question paper consists of **125 Multiple Choice Questions (MCQs)** divided as follows:
 - Physics – 40 questions
 - Chemistry – 35 questions
 - Mathematics / Biology – 40 questions
 - Aptitude – 10 questions
5. Each correct answer carries **1 mark**. There is **no negative marking**.
6. Candidates must report to the test center at least **60 minutes before** the examination.
7. Use of **mobile phones, calculators, smart watches, or any electronic gadgets** is strictly prohibited.
8. Rough work must be done on the **sheet provided at the test center** and returned to the invigilator after completion.
9. Any form of malpractice, impersonation, or communication with others will lead to disqualification.
10. Candidates must ensure that all personal details are correctly entered on the computer screen before beginning the test.

1. An object of mass 5 kg is moving with a velocity of 10 m/s. What is its kinetic energy?

- (A) 250 J
- (B) 500 J
- (C) 100 J
- (D) 50 J

Correct Answer: (A) 250 J

Solution:

Step 1: Understanding the Concept:

The question asks for the kinetic energy of a moving object. Kinetic energy is the energy that an object possesses due to its motion. It depends on the mass of the object and the square of its velocity.

Step 2: Key Formula or Approach:

The formula to calculate kinetic energy (KE) is:

$$KE = \frac{1}{2}mv^2$$

where:

m is the mass of the object.

v is the velocity of the object.

Step 3: Detailed Explanation:

We are given the following values:

Mass (m) = 5 kg

Velocity (v) = 10 m/s

Now, we substitute these values into the kinetic energy formula:

$$KE = \frac{1}{2} \times 5 \text{ kg} \times (10 \text{ m/s})^2$$

First, calculate the square of the velocity:

$$v^2 = 10^2 = 100 \text{ (m/s)}^2$$

Now, substitute this back into the equation:

$$KE = \frac{1}{2} \times 5 \times 100$$

$$KE = 2.5 \times 100$$

$$KE = 250 \text{ J}$$

The unit of energy is Joules (J).

Step 4: Final Answer:

The kinetic energy of the object is 250 J. Therefore, option (A) is the correct answer.

Quick Tip

Always ensure that the units are in the standard SI system (mass in kg, velocity in m/s) before applying the formula. The formula $KE = \frac{1}{2}mv^2$ highlights that velocity has a much greater impact on kinetic energy than mass due to the squaring factor.

2. A parallel plate capacitor has a capacitance of 10 μF . What will be its capacitance when the distance between the plates is halved?

- (A) 20 μF
- (B) 5 μF
- (C) 10 μF
- (D) 40 μF

Correct Answer: (A) 20 μF

Solution:

Step 1: Understanding the Concept:

The question asks about the change in capacitance of a parallel plate capacitor when the distance between its plates is changed. Capacitance is a measure of a capacitor's ability to store charge and is determined by its physical characteristics.

Step 2: Key Formula or Approach:

The capacitance (C) of a parallel plate capacitor is given by the formula:

$$C = \frac{\epsilon_0 A}{d}$$

where:

ϵ_0 is the permittivity of free space (a constant).

A is the area of each plate.

d is the distance between the plates.

From this formula, we can see that capacitance (C) is inversely proportional to the distance (d) between the plates, assuming A and ϵ_0 remain constant.

$$C \propto \frac{1}{d}$$

Step 3: Detailed Explanation:

Let the initial capacitance be C_1 and the initial distance be d_1 . We are given $C_1 = 10 \mu\text{F}$.

$$C_1 = \frac{\epsilon_0 A}{d_1} = 10 \mu\text{F}$$

The distance between the plates is halved. Let the new distance be d_2 .

$$d_2 = \frac{d_1}{2}$$

Let the new capacitance be C_2 . We can write the formula for the new capacitance as:

$$C_2 = \frac{\epsilon_0 A}{d_2}$$

Now, substitute the value of d_2 in terms of d_1 :

$$C_2 = \frac{\epsilon_0 A}{(d_1/2)}$$
$$C_2 = 2 \left(\frac{\epsilon_0 A}{d_1} \right)$$

Since we know that $\frac{\epsilon_0 A}{d_1} = C_1$, we can substitute this into the equation for C_2 :

$$C_2 = 2 \times C_1$$

Now, substitute the given value of C_1 :

$$C_2 = 2 \times 10 \mu\text{F} = 20 \mu\text{F}$$

Step 4: Final Answer:

When the distance between the plates is halved, the capacitance doubles. The new capacitance will be 20 μF . Therefore, option (A) is correct.

💡 Quick Tip

Remember the relationships for a parallel plate capacitor: Capacitance is directly proportional to the plate area (A) and inversely proportional to the distance (d) between them. If distance is halved, capacitance is doubled. If area is doubled, capacitance is doubled.

3. What is the wavelength of a sound wave with a frequency of 500 Hz in air (speed of sound $v = 343 \text{ m/s}$)?

- (A) 0.686 m
- (B) 1.2 m
- (C) 0.8 m
- (D) 1.0 m

Correct Answer: (A) 0.686 m

Solution:

Step 1: Understanding the Concept:

The question asks to find the wavelength of a sound wave given its frequency and speed. The relationship between speed, frequency, and wavelength is fundamental to all wave phenomena.

Step 2: Key Formula or Approach:

The relationship between the speed of a wave (v), its frequency (f), and its wavelength (λ) is given by the wave equation:

$$v = f\lambda$$

Step 3: Detailed Explanation:

We are given the following values:

Speed of sound (v) = 343 m/s

Frequency (f) = 500 Hz

We need to find the wavelength (λ). We can rearrange the wave equation to solve for λ :

$$\lambda = \frac{v}{f}$$

Now, substitute the given values into this formula:

$$\lambda = \frac{343 \text{ m/s}}{500 \text{ Hz}}$$

Since Hz is equivalent to s^{-1} , the units work out correctly to meters (m).

$$\lambda = 0.686 \text{ m}$$

Step 4: Final Answer:

The wavelength of the sound wave is 0.686 m. Therefore, option (A) is the correct answer.

💡 Quick Tip

The wave equation $v = f\lambda$ is one of the most important formulas in physics. Ensure you are comfortable rearranging it to solve for any of the three variables. Also, remember that frequency (Hz) and wavelength (m) are inversely proportional when the speed of the wave is constant.

4. A 10 kg object is moving with a velocity of 5 m/s. What is the momentum of the object?

- (A) 50 kg·m/s
- (B) 5 kg·m/s
- (C) 100 kg·m/s
- (D) 25 kg·m/s

Correct Answer: (A) 50 kg·m/s

Solution:

Step 1: Understanding the Concept:

The question asks for the momentum of a moving object. Momentum is a measure of the mass in motion. It is a vector quantity, meaning it has both magnitude and direction, and it is directly proportional to both the mass and the velocity of the object.

Step 2: Key Formula or Approach:

The formula for linear momentum (p) is:

$$p = m \times v$$

where:

m is the mass of the object.

v is the velocity of the object.

Step 3: Detailed Explanation:

We are given the following values:

Mass (m) = 10 kg

Velocity (v) = 5 m/s

Substitute these values into the momentum formula:

$$p = 10 \text{ kg} \times 5 \text{ m/s}$$

$$p = 50 \text{ kg·m/s}$$

The unit for momentum is kilogram-meter per second (kg·m/s).

Step 4: Final Answer:

The momentum of the object is 50 kg·m/s. Therefore, option (A) is the correct answer.

💡 Quick Tip

Do not confuse momentum ($p = mv$) with kinetic energy ($KE = \frac{1}{2}mv^2$). Momentum is a linear function of velocity, while kinetic energy is a quadratic function. Also, pay attention to the units: momentum is kg·m/s, while energy is Joules (kg·m²/s²).

5. A 5 kg mass is moving at a speed of 10 m/s. What is the kinetic energy of the mass?

- (A) 250 J
- (B) 500 J
- (C) 100 J
- (D) 50 J

Correct Answer: (A) 250 J

Solution:

Step 1: Understanding the Concept:

This question, similar to question 1, asks for the kinetic energy of a moving mass. Kinetic energy is the energy an object possesses due to its motion.

Step 2: Key Formula or Approach:

The formula for kinetic energy (KE) is:

$$KE = \frac{1}{2}mv^2$$

where m is the mass and v is the speed.

Step 3: Detailed Explanation:

We are given:

Mass (m) = 5 kg

Speed (v) = 10 m/s

Substitute these values into the formula:

$$KE = \frac{1}{2} \times 5 \text{ kg} \times (10 \text{ m/s})^2$$

First, square the speed:

$$v^2 = 10^2 = 100 \text{ (m/s)}^2$$

Now, calculate the kinetic energy:

$$KE = \frac{1}{2} \times 5 \times 100$$

$$KE = 2.5 \times 100$$

$$KE = 250 \text{ J}$$

Step 4: Final Answer:

The kinetic energy of the mass is 250 J. Therefore, option (A) is the correct answer.

💡 Quick Tip

Repetitive questions on core concepts like kinetic energy are common in exams. Mastering these fundamental formulas ensures you can secure these marks quickly and confidently. Always double-check your calculations, especially with squares and fractions.

6. A resistor of 10 Ω is connected in series with a 12 V battery. What is the current flowing through the resistor?

- (A) 0.5 A
- (B) 1.2 A
- (C) 0.8 A
- (D) 2.5 A

Correct Answer: (B) 1.2 A

Solution:**Step 1: Understanding the Concept:**

This question involves a simple electrical circuit and requires the application of Ohm's Law. Ohm's Law describes the relationship between voltage, current, and resistance in an electrical circuit.

Step 2: Key Formula or Approach:

Ohm's Law is stated as:

$$V = I \times R$$

where:

V is the voltage across the resistor (in Volts, V).

I is the current flowing through the resistor (in Amperes, A).

R is the resistance of the resistor (in Ohms, Ω).

Step 3: Detailed Explanation:

We are given the following values:

Voltage (V) = 12 V

Resistance (R) = 10 Ω

We need to find the current (I). We can rearrange Ohm's Law to solve for I :

$$I = \frac{V}{R}$$

Now, substitute the given values into the formula:

$$\begin{aligned} I &= \frac{12 \text{ V}}{10 \Omega} \\ I &= 1.2 \text{ A} \end{aligned}$$

The unit of current is Amperes (A).

Step 4: Final Answer:

The current flowing through the resistor is 1.2 A. Therefore, option (B) is the correct answer.

💡 Quick Tip

The "Ohm's Law Triangle" is a useful mnemonic. Draw a triangle, place V at the top, and I and R at the bottom. To find any variable, cover it with your finger, and the remaining variables show the formula (e.g., covering I leaves V over R).

7. What is the molar mass of Na_2CO_3 ?

- (A) 106 g/mol
- (B) 98 g/mol
- (C) 116 g/mol
- (D) 112 g/mol

Correct Answer: (A) 106 g/mol

Solution:**Step 1: Understanding the Concept:**

The question asks for the molar mass of sodium carbonate (Na_2CO_3). Molar mass is the mass of one mole of a substance, expressed in grams per mole (g/mol). It is calculated by summing the atomic masses of all the atoms in a molecule.

Step 2: Key Formula or Approach:

To find the molar mass of a compound, you need to:

1. Identify the elements present and the number of atoms of each element from the chemical formula.
2. Find the atomic mass of each element from the periodic table.
3. Multiply the atomic mass of each element by the number of atoms of that element in the formula.
4. Sum up these values to get the total molar mass.

Molar Mass of $\text{Na}_2\text{CO}_3 = (2 \times \text{Atomic Mass of Na}) + (1 \times \text{Atomic Mass of C}) + (3 \times \text{Atomic Mass of O})$

Step 3: Detailed Explanation:

The chemical formula is Na_2CO_3 .

The elements are Sodium (Na), Carbon (C), and Oxygen (O).

Number of atoms:

- Sodium (Na): 2
- Carbon (C): 1
- Oxygen (O): 3

Approximate atomic masses from the periodic table:

- Atomic mass of Na 23.0 g/mol
- Atomic mass of C 12.0 g/mol
- Atomic mass of O 16.0 g/mol

Now, calculate the molar mass:

$$\text{Molar Mass} = (2 \times 23.0) + (1 \times 12.0) + (3 \times 16.0)$$

$$\text{Molar Mass} = 46.0 + 12.0 + 48.0$$

$$\text{Molar Mass} = 106.0 \text{ g/mol}$$

Step 4: Final Answer:

The molar mass of Na_2CO_3 is 106 g/mol. Therefore, option (A) is the correct answer.

💡 Quick Tip

Pay close attention to the subscripts in the chemical formula. A common mistake is to forget to multiply the atomic mass by the number of atoms. It's helpful to list out each element and its contribution before summing them up.

8. Which of the following compounds is formed by covalent bonding?

- (A) NaCl
- (B) HO
- (C) NaO
- (D) KCl

Correct Answer: (B) HO

Solution:**Step 1: Understanding the Concept:**

The question asks to identify a compound formed by covalent bonding. Chemical bonds are forces that hold atoms together in molecules. The two main types are ionic and covalent bonds.

- **Ionic bonds** typically form between a metal and a non-metal. This involves the transfer of electrons from the metal to the non-metal, creating ions that are held together by electrostatic attraction.
- **Covalent bonds** typically form between two non-metal atoms. This involves the sharing of electrons between the atoms.

Step 2: Detailed Explanation:

Let's analyze each option based on the types of elements involved:

- **(A) NaCl (Sodium Chloride):** Sodium (Na) is a Group 1 metal. Chlorine (Cl) is a Group 17 non-metal. The large difference in electronegativity leads to the transfer of an electron from Na to Cl, forming an ionic bond (Na^+Cl^-).
- **(B) HO (Water):** Hydrogen (H) is a non-metal. Oxygen (O) is also a non-metal. They share electrons to form covalent bonds. Oxygen shares one electron with each of the two hydrogen atoms.
- **(C) NaO (Sodium Oxide):** Sodium (Na) is a metal. Oxygen (O) is a non-metal. Two sodium atoms each transfer one electron to one oxygen atom, forming an ionic compound ($2\text{Na}^+\text{O}^{2-}$).
- **(D) KCl (Potassium Chloride):** Potassium (K) is a Group 1 metal. Chlorine (Cl) is a non-metal. This compound is formed by the transfer of an electron from K to Cl, resulting in an ionic bond (K^+Cl^-).

Step 3: Final Answer:

Based on the analysis, HO is the only compound in the list formed by the sharing of electrons between non-metal atoms, which is characteristic of covalent bonding. Therefore, option (B) is correct.

 Quick Tip

A quick way to identify the bond type is to look at the positions of the elements in the periodic table. If the compound contains a metal from the left side (Groups 1, 2) and a non-metal from the right side (Groups 16, 17), it is almost always ionic. If it contains only non-metals, it is covalent.

9. What is the pH of a 0.001 M solution of NaOH?

- (A) 11
- (B) 13
- (C) 10
- (D) 12

Correct Answer: (A) 11

Solution:

Step 1: Understanding the Concept:

The question asks for the pH of a sodium hydroxide (NaOH) solution. NaOH is a strong base, which means it dissociates completely in water to produce hydroxide ions (OH^-). The pH scale measures the acidity or alkalinity of a solution. For basic solutions, it is often easier to first calculate the pOH and then use the relationship between pH and pOH.

Step 2: Key Formula or Approach:

1. Since NaOH is a strong base, $[\text{OH}^-] = [\text{NaOH}]$.
2. Calculate the pOH using the formula: $\text{pOH} = -\log_{10}([\text{OH}^-])$.
3. Calculate the pH using the relationship: $\text{pH} + \text{pOH} = 14$ (at 25°C).

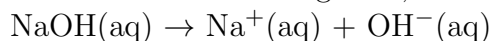
Step 3: Detailed Explanation:

The concentration of the NaOH solution is given as 0.001 M.

First, express the concentration in scientific notation:

$$[\text{NaOH}] = 0.001 \text{ M} = 1 \times 10^{-3} \text{ M}$$

Since NaOH is a strong base, it dissociates completely:



Therefore, the concentration of hydroxide ions $[\text{OH}^-]$ is equal to the concentration of the NaOH solution:

$$[\text{OH}^-] = 10^{-3} \text{ M}$$

Next, calculate the pOH:

$$\text{pOH} = -\log_{10}([\text{OH}^-]) = -\log_{10}(10^{-3})$$

Using the logarithm property $\log_{10}(10^x) = x$:

$$\text{pOH} = -(-3) = 3$$

Finally, calculate the pH using the relation $\text{pH} + \text{pOH} = 14$:

$$\text{pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 3 = 11$$

Step 4: Final Answer:

The pH of the 0.001 M NaOH solution is 11. Therefore, option (A) is the correct answer.

💡 Quick Tip

For strong acids, $\text{pH} = -\log[\text{H}^+]$. For strong bases, it's safer to calculate $\text{pOH} = -\log[\text{OH}^-]$ first and then find pH from $\text{pH} = 14 - \text{pOH}$. A common mistake is to calculate $-\log[\text{NaOH}]$ and report that as the pH, which would give 3, an acidic pH for a strong base.

10. Which of the following is the strongest oxidizing agent?

- (A) Cl
- (B) I
- (C) Br
- (D) F

Correct Answer: (D) F

Solution:

Step 1: Understanding the Concept:

The question asks to identify the strongest oxidizing agent among the halogens listed. An oxidizing agent is a substance that causes another substance to be oxidized, and in the process, it gets reduced itself (i.e., it gains electrons). The strength of an oxidizing agent is its ability to accept electrons. This ability is directly related to electronegativity.

Step 2: Detailed Explanation:

The elements listed (Cl, I, Br, F) are all halogens (Group 17). A key periodic trend for halogens is their electronegativity, which is a measure of an atom's ability to attract shared electrons to itself.

- **Electronegativity Trend:** Within a group in the periodic table, electronegativity decreases as you go down the group. This is because the number of electron shells increases, so the valence electrons are farther from the nucleus and experience more shielding, reducing the nucleus's pull.

- **Order of Halogens:** The order of halogens in Group 17 from top to bottom is Fluorine (F), Chlorine (Cl), Bromine (Br), and Iodine (I).

- **Applying the Trend:** Based on the trend, the electronegativity decreases in the order: F > Cl > Br > I.

- **Relating to Oxidizing Strength:** Since Fluorine (F) is the most electronegative element, it has the strongest desire to gain an electron. This makes the F molecule the most powerful

oxidizing agent among the halogens (and in fact, among all elements). It will readily accept electrons from other substances.

Step 3: Final Answer:

Fluorine (F) is the most electronegative element and therefore has the highest tendency to gain electrons, making it the strongest oxidizing agent. Option (D) is correct.

💡 Quick Tip

Remember the periodic trend for electronegativity: it increases from left to right across a period and decreases from top to bottom down a group. Fluorine is the most electronegative element, making F the strongest elemental oxidizing agent. Conversely, reducing strength for halide ions increases down the group (I^- is the strongest reducing agent among F^- , Cl^- , Br^- , I^-).

11. What is the IUPAC name of the compound CH_3CH_2COOH ?

- (A) Ethanoic acid
- (B) Propanoic acid
- (C) Butanoic acid
- (D) Acetic acid

Correct Answer: (B) Propanoic acid

Solution:

Step 1: Understanding the Concept:

The question asks for the IUPAC (International Union of Pure and Applied Chemistry) name of a given organic compound. IUPAC nomenclature provides a systematic way of naming organic compounds based on their structure.

Step 2: Key Formula or Approach:

The steps for naming a carboxylic acid are:

1. Identify the longest carbon chain that includes the carboxyl group ($-COOH$). This forms the root name (alkane base).
2. Number the carbon chain starting with the carboxyl carbon as carbon 1.
3. Replace the "-e" ending of the parent alkane name with the suffix "-oic acid".
4. Name and number any substituents on the chain.

Step 3: Detailed Explanation:

Let's apply these steps to the compound CH_3CH_2COOH .

1. **Identify the longest carbon chain:** The chain contains three carbon atoms (C from CH_3 , C from CH_2 , and C from $COOH$).
2. **Determine the parent alkane name:** A three-carbon alkane is propane.
3. **Apply the suffix for the functional group:** The functional group is a carboxylic acid ($-COOH$). We replace the "-e" from propane with "-oic acid".

Propane $\rightarrow$ Propanoic acid.

The numbering starts from the $COOH$ carbon, so it is 1-propanoic acid, but since the functional group is always at the end of the chain, the "1-" is usually omitted.

Let's also look at the other options:

- (A) **Ethanoic acid:** This has a two-carbon chain (CH_3COOH).

- (C) **Butanoic acid**: This has a four-carbon chain (CHCHCHCOOH).
- (D) **Acetic acid**: This is the common (not IUPAC) name for ethanoic acid (CHCOOH).

Step 4: Final Answer:

The compound CHCHCOOH has three carbons, so its IUPAC name is Propanoic acid.

Option (B) is the correct answer.

 Quick Tip

To quickly find the IUPAC name for simple alkanolic acids, just count the total number of carbon atoms and use the appropriate prefix (Eth- for 2, Prop- for 3, But- for 4, etc.), then add the suffix "-oic acid".

12. Solve for x in the equation $3x + 5 = 2x + 7$.

- (A) $x = 2$
- (B) $x = -2$
- (C) $x = 0$
- (D) $x = 1$

Correct Answer: (A) $x = 2$

Solution:

Step 1: Understanding the Concept:

This question requires solving a linear equation in one variable. The goal is to isolate the variable (x) on one side of the equation to find its value.

Step 2: Key Formula or Approach:

To solve for x , we will use algebraic manipulation. The main principle is to perform the same operation on both sides of the equation to maintain equality. We will first gather all terms with x on one side and all constant terms on the other.

Step 3: Detailed Explanation:

The given equation is:

$$3x + 5 = 2x + 7$$

Step 3.1: Group the x terms.

To get all the x terms on the left side, subtract $2x$ from both sides of the equation:

$$\begin{aligned}(3x - 2x) + 5 &= (2x - 2x) + 7 \\ x + 5 &= 7\end{aligned}$$

Step 3.2: Group the constant terms.

Now, to get the constant terms on the right side, subtract 5 from both sides of the equation:

$$\begin{aligned}x + 5 - 5 &= 7 - 5 \\ x &= 2\end{aligned}$$

Step 4: Final Answer:

The value of x that satisfies the equation is 2. Therefore, option (A) is the correct answer.

 Quick Tip

After solving, it's always a good practice to check your answer by substituting the value of x back into the original equation. For $x = 2$: $3(2) + 5 = 6 + 5 = 11$. And $2(2) + 7 = 4 + 7 = 11$. Since both sides are equal ($11 = 11$), the solution is correct.

13. Find the value of x in the quadratic equation $x^2 - 5x + 6 = 0$.

- (A) $x = 2, 3$
- (B) $x = -2, -3$
- (C) $x = 1, 6$
- (D) $x = -1, 6$

Correct Answer: (A) $x = 2, 3$

Solution:

Step 1: Understanding the Concept:

The question asks to find the roots (or solutions) of a quadratic equation. A quadratic equation is a polynomial equation of the second degree, of the form $ax^2 + bx + c = 0$. The solutions can be found by factoring, completing the square, or using the quadratic formula.

Step 2: Key Formula or Approach:

We will solve this equation by factoring. The goal is to find two numbers that multiply to the constant term ($c = 6$) and add up to the coefficient of the x term ($b = -5$).

Step 3: Detailed Explanation:

The given equation is:

$$x^2 - 5x + 6 = 0$$

We need to find two numbers that:

- Multiply to +6
- Add to -5

Let's consider the pairs of factors for 6: (1, 6), (2, 3), (-1, -6), (-2, -3).

Now, let's check their sums:

- $1 + 6 = 7$
- $2 + 3 = 5$
- $(-1) + (-6) = -7$
- $(-2) + (-3) = -5$

The pair that satisfies both conditions is -2 and -3. So, we can factor the quadratic equation as:

$$(x - 2)(x - 3) = 0$$

For the product of two factors to be zero, at least one of the factors must be zero. So we set each factor to zero and solve for x :

Case 1:

$$x - 2 = 0 \implies x = 2$$

Case 2:

$$x - 3 = 0 \implies x = 3$$

The two solutions for x are 2 and 3.

Step 4: Final Answer:

The values of x that satisfy the quadratic equation are 2 and 3. Therefore, option (A) is the correct answer.

 Quick Tip

When factoring a quadratic equation $x^2 + bx + c = 0$, pay attention to the signs. If c is positive and b is negative, both factors must be negative. If c is positive and b is positive, both factors must be positive. If c is negative, the factors will have opposite signs.

14. Find the sum of the roots of the quadratic equation $2x^2 - 3x - 5 = 0$.

- (A) $\frac{1}{2}$
- (B) $\frac{3}{2}$
- (C) $\frac{5}{2}$
- (D) $-\frac{5}{2}$

Correct Answer: (B) $\frac{3}{2}$

Solution:

Step 1: Understanding the Concept:

The question asks for the sum of the roots of a given quadratic equation. For any quadratic equation, there is a direct relationship between the coefficients of the equation and the sum and product of its roots. This allows us to find the sum without actually solving for the roots.

Step 2: Key Formula or Approach:

For a general quadratic equation of the form $ax^2 + bx + c = 0$, where a , b , and c are coefficients, the sum of the roots ($\alpha + \beta$) is given by the formula:

$$\text{Sum of roots} = -\frac{b}{a}$$

The product of the roots ($\alpha\beta$) is given by $\frac{c}{a}$.

Step 3: Detailed Explanation:

The given quadratic equation is:

$$2x^2 - 3x - 5 = 0$$

First, identify the coefficients a , b , and c :

- $a = 2$
- $b = -3$
- $c = -5$

Now, apply the formula for the sum of the roots:

$$\text{Sum of roots} = -\frac{b}{a} = -\frac{(-3)}{2}$$

$$\text{Sum of roots} = \frac{3}{2}$$

Step 4: Final Answer:

The sum of the roots of the equation $2x^2 - 3x - 5 = 0$ is $\frac{3}{2}$. Therefore, option (B) is the correct answer.

💡 Quick Tip

Using the formulas for the sum $(-b/a)$ and product (c/a) of roots is a significant shortcut in competitive exams. It saves time from having to solve the quadratic equation completely using the quadratic formula, which can be more complex and prone to calculation errors.

15. Find the value of x that satisfies the equation $\frac{3x+4}{2} = 5$.

- (A) $x = 3$
- (B) $x = 4$
- (C) $x = 2$
- (D) $x = 5$

Correct Answer: (C) $x = 2$

Solution:

Note: The OCR for the question might be ambiguous. Based on the options, the most likely intended equation is $\frac{3x+4}{2} = 5$ instead of what might appear as $\frac{3x}{2} - 4 = 5$, as the former leads to one of the given answers.

Step 1: Understanding the Concept:

The question requires solving a linear equation that involves a fraction. The goal is to isolate the variable x by performing a series of algebraic operations.

Step 2: Key Formula or Approach:

To solve for x , we will first eliminate the denominator by multiplying both sides of the equation by it. Then, we will isolate the term containing x and finally solve for x .

Step 3: Detailed Explanation:

The assumed equation is:

$$\frac{3x + 4}{2} = 5$$

Step 3.1: Eliminate the denominator.

Multiply both sides of the equation by 2:

$$2 \times \left(\frac{3x + 4}{2} \right) = 5 \times 2$$

$$3x + 4 = 10$$

Step 3.2: Isolate the x term.

Subtract 4 from both sides of the equation:

$$3x + 4 - 4 = 10 - 4$$

$$3x = 6$$

Step 3.3: Solve for x .

Divide both sides by 3:

$$\begin{aligned}\frac{3x}{3} &= \frac{6}{3} \\ x &= 2\end{aligned}$$

Step 4: Final Answer:

The value of x that satisfies the equation is 2. Therefore, option (C) is the correct answer.

 Quick Tip

When an equation involves fractions, the first step is often to "clear" the fractions by multiplying the entire equation by the least common multiple (LCM) of the denominators. This simplifies the equation and makes it easier to solve. Also, if your solution doesn't match the options, re-read the question for possible misinterpretations or typos.