AP EAPCET 2025 May 24 Shift 2 Question Paper with Solutions

Time Allowed :3 Hours	**Maximum Marks :**160	**Total questions :**160

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Duration of Exam: 3 Hours
2. Total Number of Questions: 160 Questions
3. Section-wise Distribution of Questions:
   - Physics - 40 Questions
   - Chemistry - 40 Questions
   - Mathematics - 80 Questions
4. Type of Questions: Multiple Choice Questions (Objective)
5. Marking Scheme: One mark awarded for each correct response
6. Negative Marking: There is no provision for negative marking.

1.

If the roots of the quadratic equation $x^2 - 6x + k = 0$ have a difference of 2, find the value of k.

(A) 5

(B) 7

(C) 8

(D) 9

Correct Answer: (C) 8

Solution:

For the quadratic equation $x^2 - 6x + k = 0$, let the roots be p and q. For a quadratic equation $ax^2 + bx + c = 0$: - Sum of roots: $p + q = -\frac{b}{a} = -\frac{-6}{1} = 6$ - Product of roots: $pq = \frac{c}{a} = \frac{k}{1} = k$ - Given: Difference of roots $|p - q| = 2$.

Using the identity for the difference of roots:

$$|p - q| = \sqrt{(p + q)^2 - 4pq}$$

Substitute $p + q = 6$ and $pq = k$:

$$\sqrt{6^2 - 4k} = 2$$

$$\sqrt{36 - 4k} = 2$$

Square both sides:

$$36 - 4k = 4 \implies 4k = 36 - 4 = 32 \implies k = 8$$

Thus, the value of k is:

$$\boxed{8}$$

Quick Tip

For a quadratic equation, use the difference of roots formula $|p - q| = \sqrt{(p + q)^2 - 4pq}$ to relate the sum and product of roots.

2.

Evaluate $\int_1^2 \frac{1}{x^2}\,dx$.

(A) $\frac{1}{2}$

(B) 1

(C) $\frac{3}{2}$

(D) 2

Correct Answer: (A) $\frac{1}{2}$

Solution:

To evaluate $\int_1^2 \frac{1}{x^2}\,dx = \int_1^2 x^{-2}\,dx$, find the antiderivative:

$$\int x^{-2}\,dx = \int x^{-2}\,dx = \frac{x^{-1}}{-1} = -\frac{1}{x} + C$$

Apply the definite integral from 1 to 2:

$$\left[-\frac{1}{x}\right]_1^2 = -\frac{1}{2} - \left(-\frac{1}{1}\right) = -\frac{1}{2} + 1 = \frac{1}{2}$$

Thus, the value of the integral is:

$$\boxed{\frac{1}{2}}$$

Quick Tip

For integrals of the form $\int x^n\,dx$, the antiderivative is $\frac{x^{n+1}}{n+1}$ (for $n \neq -1$); for $n = -2$, it's $-\frac{1}{x}$.

3.

Find the area of the triangle with vertices at (0, 0), (3, 0), and (0, 4).

(A) 6

(B) 8

(C) 10

(D) 12

Correct Answer: (A) 6

Solution:

The vertices of the triangle are (0, 0), (3, 0), and (0, 4). This forms a right-angled triangle with the right angle at (0, 0). The base lies along the x-axis from (0, 0) to (3, 0) with length 3, and the height lies along the y-axis from (0, 0) to (0, 4) with length 4. The area of a right-angled triangle is:

$$\text{Area} = \frac{1}{2} \cdot \text{base} \cdot \text{height} = \frac{1}{2} \cdot 3 \cdot 4 = 6$$

Alternatively, use the determinant formula for the area of a triangle with vertices $(x_1, y_1), (x_2, y_2), (x_3, y_3)$:

$$\text{Area} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

Substitute (0, 0), (3, 0), (0, 4):

$$\text{Area} = \frac{1}{2} |0 \cdot (0 - 4) + 3 \cdot (4 - 0) + 0 \cdot (0 - 0)| = \frac{1}{2} |0 + 12 + 0| = \frac{12}{2} = 6$$

The area is:

$$\boxed{6}$$

Quick Tip

For a triangle with vertices on the axes, use Area $= \frac{1}{2} \cdot$ base $\cdot$ height, or apply the determinant formula for general vertices.

4.

The mean of 5 numbers is 10, and their variance is 16. If one number is increased by 5, what is the new mean?

(A) 10

(B) 11

(C) 12

(D) 13

Correct Answer: (B) 11

Solution:

The mean of 5 numbers is 10, so their sum is:

$$5 \cdot 10 = 50$$

If one number is increased by 5, the new sum is:

$$50 + 5 = 55$$

The new mean for 5 numbers is:

$$\text{New mean} = \frac{55}{5} = 11$$

(Note: Variance is not needed to calculate the new mean, as it only affects the spread, not the sum.) Thus, the new mean is:

$$\boxed{11}$$

Quick Tip

To find the new mean after altering one data point, adjust the sum by the change and divide by the number of data points.

5.

If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$**, find the inverse of matrix** A**.**

(A) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

(B) $\begin{bmatrix} -2 & 1 \\ \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$

(C) $\begin{bmatrix} 2 & -1 \\ -\frac{3}{2} & \frac{1}{2} \end{bmatrix}$

(D) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

Correct Answer: (A) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

Solution:

For a 2x2 matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, the inverse is:

$$A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Given $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, where $a = 1$, $b = 2$, $c = 3$, $d = 4$: - Determinant: $ad - bc = 1 \cdot 4 - 2 \cdot 3 = 4 - 6 = -2$ - Inverse:

$$A^{-1} = \frac{1}{-2} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix} = \begin{bmatrix} \frac{4}{-2} & \frac{-2}{-2} \\ \frac{-3}{-2} & \frac{1}{-2} \end{bmatrix} = \begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$$

Thus, the inverse is:

$$\boxed{\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}}$$

Quick Tip

To find the inverse of a 2x2 matrix, compute the determinant $ad - bc$, then use $A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$.

6.

If $z = 1 + i$, find the modulus of z^2.

(A) $\sqrt{2}$

(B) 2

(C) $2\sqrt{2}$

(D) 4

Correct Answer: (B) 2

Solution:

Given $z = 1 + i$, compute z^2:

$$z^2 = (1+i)^2 = 1^2 + 2 \cdot 1 \cdot i + i^2 = 1 + 2i + (-1) = 2i$$

The modulus of a complex number $a + bi$ is $\sqrt{a^2 + b^2}$. For $z^2 = 0 + 2i$:

$$|z^2| = \sqrt{0^2 + 2^2} = \sqrt{4} = 2$$

Alternatively, since $|z| = \sqrt{1^2 + 1^2} = \sqrt{2}$, the modulus of z^2 is:

$$|z^2| = |z|^2 = (\sqrt{2})^2 = 2$$

The modulus is:

$$\boxed{2}$$

Quick Tip

For a complex number z, the modulus of z^n is $|z|^n$, and for $z = a + bi$, the modulus is $\sqrt{a^2 + b^2}$.

7.

A box contains 4 white and 6 black balls. If 3 balls are drawn at random with replacement, what is the probability that at least one is white?

(A) $\frac{27}{125}$

(B) $\frac{98}{125}$

(C) $\frac{64}{125}$

(D) $\frac{61}{125}$

Correct Answer: (B) $\frac{98}{125}$

Solution:

The probability of drawing a white ball is:

$$P(\text{white}) = \frac{4}{4+6} = \frac{4}{10} = \frac{2}{5}$$

The probability of drawing a black ball is:

$$P(\text{black}) = \frac{6}{10} = \frac{3}{5}$$

Since draws are with replacement, the probability of all three balls being black is:

$$P(\text{all black}) = \left(\frac{3}{5}\right)^3 = \frac{27}{125}$$

The probability of at least one white ball is:

$$P(\text{at least one white}) = 1 - P(\text{all black}) = 1 - \frac{27}{125} = \frac{125 - 27}{125} = \frac{98}{125}$$

The probability is:

$$\boxed{\frac{98}{125}}$$

Quick Tip

To find the probability of at least one event occurring, calculate $1 - P(\text{none occur})$, especially for independent events like draws with replacement.

'8.

A particle is projected with a velocity of 20 m/s at an angle of 30° to the horizontal. What is the maximum height reached? (Take $g = 10\,\text{m/s}^2$).

(A) 5 m

(B) 10 m

(C) 15 m

(D) 20 m

Correct Answer: (A) 5 m

Solution:

The maximum height of a projectile is given by:

$$H = \frac{u^2 \sin^2\theta}{2g}$$

where $u = 20\,\text{m/s}$, $\theta = 30°$, and $g = 10\,\text{m/s}^2$. Since $\sin 30° = \frac{1}{2}$, we have:

$$\sin^2 30° = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$H = \frac{20^2 \cdot \frac{1}{4}}{2 \cdot 10} = \frac{400 \cdot \frac{1}{4}}{20} = \frac{100}{20} = 5\,\text{m}$$

Thus, the maximum height is:

$$\boxed{5}$$

Quick Tip

For projectile motion, use $H = \frac{u^2 \sin^2 \theta}{2g}$ to find the maximum height, ensuring the angle is in degrees and $\sin \theta$ is calculated correctly.

9.

A convex lens has a focal length of 20 cm. If an object is placed 30 cm from the lens, what is the image distance?

(A) 12 cm

(B) 15 cm

(C) 60 cm

(D) 90 cm

Correct Answer: (C) 60 cm

Solution:

For a lens, use the lens formula:

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

where $f = 20\,\text{cm}$ (focal length, positive for convex lens), $u = 30\,\text{cm}$ (object distance, positive as object is on the incident side). Solve for v (image distance):

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60}$$

$$v = 60\,\text{cm}$$

Since v is positive, the image is formed 60 cm on the opposite side of the lens. The image distance is:

$$\boxed{60}$$

Quick Tip

Use the lens formula $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$, with the sign convention: f is positive for convex lenses, u is positive for real objects, and solve for v.

10.

Two charges $+5\,\mu$C and $+5\,\mu$C are placed 1 m apart. What is the electric potential at the midpoint between them? (Take $k = 9 \times 10^9$ N·m^2/C^2).

(A) 9×10^4 V

(B) 1.8×10^5 V

(C) 2.7×10^5 V

(D) 3.6×10^5 V

Correct Answer: (B) 1.8×10^5 V

Solution:

The electric potential V due to a point charge q at distance r is:

$$V = k\frac{q}{r}$$

The charges are $q_1 = q_2 = 5 \times 10^{-6}$ C, and they are 1 m apart, so the midpoint is at $r = 0.5\,\mathrm{m}$ from each charge. The total potential at the midpoint is the sum of potentials due to both charges:

$$V_{\text{total}} = V_1 + V_2 = k\frac{q_1}{r} + k\frac{q_2}{r} = \frac{k}{r}(q_1 + q_2)$$

$$= \frac{9 \times 10^9}{0.5}(5 \times 10^{-6} + 5 \times 10^{-6}) = 18 \times 10^9 \cdot 10 \times 10^{-6} = 18 \times 10^4 = 1.8 \times 10^5\,\text{V}$$

The electric potential is:

$$\boxed{1.8 \times 10^5}$$

Quick Tip

For electric potential at a point due to multiple charges, sum the potentials $V = k\frac{q}{r}$ for each charge, using consistent units (charge in C, distance in m).
