

Q1. JEE Main 2026 (21 January Shift 2)

A random variable X takes values 0, 1, 2, 3 with probabilities $\frac{2a+1}{30}$, $\frac{8a-1}{30}$, $\frac{4a+1}{30}$, b respectively, where $a, b \in \mathbf{R}$. Let μ and σ respectively be the mean and standard deviation of X such that $\sigma^2 + \mu^2 = 2$. Then $\frac{a}{b}$ is equal to :

- (1) 12 (2) 30 (3) 60 (4) 3

Q2. JEE Main 2026 (23 January Shift 1)

From the first 100 natural numbers, two numbers first a and then b are selected randomly without replacement. If the probability that $a - b \geq 10$ is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $m + n$ is equal to _____.

Q3. JEE Main 2026 (28 January Shift 2)

The probability distribution of a random variable X is given below :

X	$4k$	$\frac{30}{7}k$	$\frac{32}{7}k$	$\frac{34}{7}k$	$\frac{36}{7}k$	$\frac{38}{7}k$	$\frac{40}{7}k$	$6k$
$P(X)$	$\frac{2}{15}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{1}{5}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{1}{5}$	$\frac{1}{15}$

If $E(X) = \frac{263}{15}$, then $P(X < 20)$ is equal to :

- (1) $\frac{11}{15}$ (2) $\frac{3}{5}$ (3) $\frac{14}{15}$ (4) $\frac{8}{15}$

Q4. JEE Main 2026 (24 January Shift 2)

Let S be a set of 5 elements and $P(S)$ denote the power set of S . Let E be an event of choosing an ordered pair (A, B) from the set $P(S) \times P(S)$ such that $A \cap B = \emptyset$. If the probability of the event E is $\frac{3^p}{2^q}$, where $p, q \in \mathbf{N}$, then $p + q$ is equal to _____

Q5. JEE Main 2026 (22 January Shift 1)

If a random variable x has the probability distribution

x	0	1	2	3	4	5	6	7
$P(x)$	0	$2k$	k	$3k$	$2k^2$	$2k$	$k^2 + k$	$7k^2$

then $P(3 < x \leq 6)$ is equal to

- (1) 0.64 (2) 0.22 (3) 0.33 (4) 0.34

Q6. JEE Main 2026 (22 January Shift 1)

Two distinct numbers a and b are selected at random from 1, 2, 3, ..., 50. The probability, that their product ab is divisible by 3, is

- (1) $\frac{272}{1225}$ (2) $\frac{561}{1225}$ (3) $\frac{664}{1225}$ (4) $\frac{8}{25}$

Q7. JEE Main 2026 (23 January Shift 2)

Bag A contains 9 white and 8 black balls, while bag B contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag A.

If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p, q) = 1$, then $p + q$ is equal to

(1) 23

(2) 24

(3) 21

(4) 22

Q8. JEE Main 2026 (28 January Shift 1)

A bag contains 10 balls out of which k are red and $(10 - k)$ are black, where $0 \leq k \leq 10$. If three balls are drawn at random without replacement and all of them are found to be black, then the probability that the bag contains 1 red and 9 black balls is:

(1) $\frac{14}{55}$ (2) $\frac{7}{55}$ (3) $\frac{7}{110}$ (4) $\frac{7}{11}$ **Q9. JEE Main 2026 (24 January Shift 1)**

From a lot containing 10 defective and 90 non-defective bulbs, 8 bulbs are selected one by one with replacement. Then the probability of getting at least 7 defective bulbs is

(1) $\frac{67}{10^8}$ (2) $\frac{7}{10^7}$ (3) $\frac{81}{10^8}$ (4) $\frac{73}{10^8}$

ANSWERS AND SOLUTIONS

1. (3) 2. 311 3. (1) 4. 15 5. (3) 6. (3) 7. (1) 8. (1)
9. (4)

1. (3) Sum of probabilities = 1: $\frac{2a+1+8a-1+4a+1}{30} + b = 1 \Rightarrow b = \frac{29-14a}{30}$.

$$\sigma^2 + \mu^2 = E(X^2) = 2.$$

$$E(X^2) = \frac{8a-1}{30} + \frac{4(4a+1)}{30} + \frac{9(29-14a)}{30} = \frac{-102a+264}{30} = 2.$$

$$-102a + 264 = 60 \Rightarrow a = 2.$$

$$b = \frac{29-28}{30} = \frac{1}{30}.$$

$$\frac{a}{b} = \frac{2}{1/30} = 60.$$

2. (311) Total ordered selections = $100 \times 99 = 9900$.

Favorable ($a - b \geq 10$): for each b from 1 to 90, a ranges from $b + 10$ to 100, giving $91 - b$ choices.

$$\text{Count} = \sum_{b=1}^{90} (91 - b) = \sum_{k=1}^{90} k = \frac{90 \times 91}{2} = 4095.$$

$$\text{Probability} = \frac{4095}{9900} = \frac{91}{220} \text{ (after dividing by 45).}$$

$$\gcd(91, 220) = 1, \text{ so } m = 91, n = 220.$$

$$m + n = 311.$$

3. (1) $E(X) = \sum X_i P(X_i) = \frac{526k}{15 \times 7} = \frac{263}{15}$
 $\Rightarrow k = \frac{7}{2}$

Substituting $k = \frac{7}{2}$, the values of X become:

$$X: 14, 15, 16, 17, 18, 19, 20, 21$$

$$P(X): \frac{2}{15}, \frac{1}{15}, \frac{2}{15}, \frac{1}{5}, \frac{1}{15}, \frac{2}{15}, \frac{1}{5}, \frac{1}{15}$$

$$P(X < 20) = \sum_{X=14}^{19} P(X)$$

$$= \frac{2}{15} + \frac{1}{15} + \frac{2}{15} + \frac{1}{5} + \frac{1}{15} + \frac{2}{15} = \frac{11}{15}$$

4. (15) S has 5 elements, so $P(S)$ has $2^5 = 32$ subsets.

Total ordered pairs from $P(S) \times P(S)$ is $32^2 = 1024$

For pairs (A, B) with $A \cap B = \emptyset$: each of the 5 elements has 3 choices - in A only, in B only, or in neither

$$\text{Number of favorable outcomes} = 3^5 = 243$$

$$\text{Probability} = \frac{243}{1024} = \frac{3^5}{2^{10}}$$

With $p = 5$ and $q = 10$, we get $p + q = 15$

5. (3) Sum of all probabilities = 1

$$\Rightarrow 0 + 2k + k + 3k + 2k^2 + 2k + (k^2 + k) + 7k^2 = 1$$

$$\Rightarrow 10k^2 + 9k - 1 = 0.$$

$$\Rightarrow (10k - 1)(k + 1) = 0$$

$$\Rightarrow k = \frac{1}{10} \text{ (rejecting } k = -1).$$

$$P(3 < x \leq 6) = P(4) + P(5) + P(6)$$

$$= 2k^2 + 2k + k^2 + k$$

$$= 3k^2 + 3k = 3(0.01) + 3(0.1) = 0.33.$$

6. (3) Total ways = $\binom{50}{2} = 1225$.

ab is divisible by 3 iff at least one of a, b is divisible by 3.

Multiples of 3 in $\{1, \dots, 50\}$: $3, 6, \dots, 48 \Rightarrow 16$ numbers. Non-multiples of 3: 34.

$$P(\text{neither divisible by 3}) = \frac{\binom{34}{2}}{\binom{50}{2}} = \frac{561}{1225}.$$

$$P(ab \text{ divisible by 3}) = 1 - \frac{561}{1225} = \frac{664}{1225}.$$

7. (1) Bag A: 9W, 8B. Bag B: 6W, 4B.

Case 1: White transferred from B (prob = $\frac{6}{10}$). A becomes 10W, 8B. $P(\text{white from A}) = \frac{10}{18} = \frac{5}{9}$.

Case 2: Black transferred from B (prob = $\frac{4}{10}$). A becomes 9W, 9B. $P(\text{white from A}) = \frac{9}{18} = \frac{1}{2}$.

$$\text{Total probability} = \frac{6}{10} \cdot \frac{5}{9} + \frac{4}{10} \cdot \frac{1}{2} = \frac{1}{3} + \frac{1}{5} = \frac{8}{15}.$$

$$p = 8, q = 15, \gcd(8, 15) = 1. \text{ So } p + q = 23.$$

8. (1) Using Bayes' theorem:

$$P(k = 1 | \text{all black}) = \frac{P(\text{all black} | k=1) \cdot P(k=1)}{P(\text{all black})} \text{ where } P(k) = \frac{1}{11} \text{ for each } k \in \{0, 1, \dots, 10\}.$$

$$\text{When } k = 1: P(\text{all 3 black} | k = 1) = \frac{\binom{9}{3}}{\binom{10}{3}} = \frac{84}{120} = \frac{7}{10}.$$

$$\text{Calculating } P(\text{all black}) = \frac{1}{11} \sum_{k=0}^{10} \frac{\binom{10-k}{3}}{120}.$$

$$\text{Numerator is } 120 + 84 + 56 + 35 + 20 + 10 + 4 + 1 = 330.$$

$$\text{So } P(\text{all black}) = \frac{1}{11} \cdot \frac{330}{120} = \frac{1}{4}.$$

$$\text{Therefore } P(k = 1 | \text{all black}) = \frac{\frac{7}{10} \cdot \frac{1}{11}}{\frac{1}{4}} = \frac{7}{10} \cdot \frac{4}{11} = \frac{28}{110} = \frac{14}{55}.$$

9. (4) Binomial distribution with $n = 8, p = \frac{1}{10}, q = \frac{9}{10}$.

$$P(X \geq 7) = P(X = 7) + P(X = 8)$$

$$P(X = 7) = \binom{8}{7} \left(\frac{1}{10}\right)^7 \left(\frac{9}{10}\right) = \frac{72}{10^8}$$

$$P(X = 8) = \left(\frac{1}{10}\right)^8 = \frac{1}{10^8}$$

$$P(X \geq 7) = \frac{73}{10^8}$$