JEE Main 2027 Practice Paper 1

Paper 1 (B.E./B.Tech) · Full-length practice test in the latest JEE Main pattern, with answer key and solutions.

Duration	3 hours
Questions	75: 25 each in Mathematics, Physics and Chemistry (Section A: 20 MCQs; Section B: 5 numerical-value questions)
Marking	+4 for a correct answer, −1 for a wrong answer, 0 if not attempted
Maximum marks	300
Note	Original practice paper written to the JEE Main pattern. It is NOT an NTA previous year question paper.

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Mathematics

Section A · Multiple choice (one correct option)

Q1. If $z = (1 + i)/(1 - i)$, then z^{2026} equals

(A) i (B) $-i$
(C) 1 (D) -1

Q2. If α and β are the roots of $x^2 - 5x + 3 = 0$, then $\alpha^2 + \beta^2$ equals

(A) 22 (B) 25
(C) 31 (D) 19

Q3. If A is the 2×2 matrix with rows (2, 1) and (3, 4), then $|\text{adj } A|$ equals

(A) 25 (B) 5
(C) 1/5 (D) 10

Q4. The number of distinct arrangements of the letters of the word LEVEL is

(A) 120 (B) 60
(C) 30 (D) 20

Q5. The coefficient of x^3 in the expansion of $(1 + 2x)^6$ is

(A) 160 (B) 240
(C) 80 (D) 120

Q6. The sum of the infinite series $3 + 1 + 1/3 + 1/9 + \ldots$ is

(A) 3/2 (B) 9
(C) 6 (D) 9/2

Q7. $\lim_{x \to 0} (\sin 3x)/x$ equals

(A) 0 (B) 1
(C) 3 (D) 1/3

Q8. If $y = x^x$, then dy/dx at $x = 1$ equals

(A) 2 (B) 1
(C) 0 (D) e

Q9. $\int_0^{\pi/2} \sin^2 x \, dx$ equals

(A) $\pi/4$ (B) π
(C) 1/2 (D) $\pi/2$

Q10. The area enclosed between the curves $y = x^2$ and $y = x$ is

(A) 1/12 (B) 1/3
(C) 1/6 (D) 1/2

Q11. If $dy/dx = y/x$ and $y(1) = 2$, then $y(3)$ equals

(A) 9 (B) 6
(C) 3 (D) 2/3

Q12. The perpendicular distance of the point (1, 2) from the line $3x + 4y - 1 = 0$ is

(A) 2 (B) 10
(C) 1 (D) 2/5

Q13. The radius of the circle $x^2 + y^2 - 4x + 6y - 3 = 0$ is

(A) 16 (B) $\sqrt{10}$
(C) 2 (D) 4

Q14. The focus of the parabola $y^2 = 12x$ is

(A) (3, 0) (B) (−3, 0)
(C) (0, 3) (D) (12, 0)

Q15. The angle between the vectors $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$ is

(A) $\pi/2$ (B) $\pi/4$
(C) $\pi/6$ (D) $\pi/3$

Q16. The distance between the parallel planes $x + 2y + 2z = 3$ and $x + 2y + 2z = 9$ is

(A) 6 (B) 2
(C) 3 (D) 4

Q17. The variance of the observations 2, 4, 6, 8, 10 is

(A) 4 (B) 8
(C) $2\sqrt{2}$ (D) 10

Q18. Two fair dice are thrown. The probability that the sum is 7 is

(A) 7/36 (B) 1/12
(C) 5/36 (D) 1/6

Q19. The value of $\sin 75^\circ$ is

(A) $(\sqrt{3} + 1)/4$ (B) $(\sqrt{2} + 1)/4$
(C) $(\sqrt{6} - \sqrt{2})/4$ (D) $(\sqrt{6} + \sqrt{2})/4$

Q20. If $n(A) = 20$, $n(B) = 15$ and $n(A \cap B) = 5$, then $n(A \cup B)$ equals

(A) 40 (B) 25
(C) 30 (D) 35

Section B · Numerical value (enter the answer as a number)

Q21. The number of subsets of a 6-element set that contain at least 2 elements is ____.

Q22. The local maximum value of $f(x) = x^3 - 3x$ is ____.

Q23. The value of $\int_0^2 (3x^2 + 1)\,dx$ is ____.

Q24. The number of three-digit natural numbers divisible by 7 is ____.

Q25. If $|a| = 3$, $|b| = 4$ and $a \cdot b = 6$, then $|a \times b|^2$ is ____.

Physics

Section A · Multiple choice (one correct option)

Q26. The dimensional formula of Planck's constant is
(A) $[MLT^{-1}]$ (B) $[ML^2T^{-1}]$
(C) $[ML^{-1}T^{-1}]$ (D) $[ML^2T^{-2}]$

Q27. A ball is thrown vertically upward at 20 m/s ($g = 10\ m/s^2$). The maximum height reached is
(A) 40 m (B) 2 m
(C) 10 m (D) 20 m

Q28. The maximum horizontal range of a projectile launched at 20 m/s ($g = 10\ m/s^2$) is
(A) 40 m (B) 80 m
(C) 10 m (D) 20 m

Q29. A 5 kg block on a rough floor ($\mu_k = 0.2$) is pulled by a horizontal 30 N force ($g = 10\ m/s^2$). Its acceleration is
(A) $6\ m/s^2$ (B) $2\ m/s^2$
(C) $5\ m/s^2$ (D) $4\ m/s^2$

Q30. The work done in stretching a spring of constant 200 N/m by 0.1 m is
(A) 0.5 J (B) 2 J
(C) 10 J (D) 1 J

Q31. The moment of inertia of a solid sphere of mass M and radius R about a diameter is
(A) $(2/5)MR^2$ (B) $(2/3)MR^2$
(C) $(7/5)MR^2$ (D) $(1/2)MR^2$

Q32. If a planet's radius were halved with its mass unchanged, its escape velocity would become
(A) $\sqrt{2}$ times (B) $1/\sqrt{2}$ times
(C) 2 times (D) unchanged

Q33. A 2 m wire of cross-section 1 mm^2 stretches by 1 mm under a 100 N load. Its Young's modulus is
(A) 2×10^{11} Pa (B) 2×10^{12} Pa
(C) 1×10^{11} Pa (D) 2×10^{10} Pa

Q34. The efficiency of a Carnot engine working between 500 K and 300 K is
(A) 40% (B) 30%
(C) 67% (D) 60%

Q35. If the absolute temperature of an ideal gas is made four times, the rms speed of its molecules becomes
(A) unchanged (B) 2 times
(C) $\sqrt{2}$ times (D) 4 times

Q36. For the motion $x = 5\sin(2\pi t + \pi/3)$ cm, the time period is
(A) 1 s (B) 2 s
(C) 0.5 s (D) π s

Q37. The force between two 1 μC charges kept 1 m apart in vacuum is
(A) 9×10^3 N (B) 9×10^{-6} N
(C) 9×10^{-3} N (D) 9×10^{-9} N

Q38. Capacitors of 2 μF and 3 μF are connected in series. The equivalent capacitance is
(A) 0.83 μF (B) 6 μF
(C) 1.2 μF (D) 5 μF

Q39. Three 6 Ω resistors are connected in parallel. The equivalent resistance is
(A) 2 Ω (B) 6 Ω
(C) 18 Ω (D) 3 Ω

Q40. The magnetic field at the centre of a circular loop of radius R carrying current I is
(A) $\mu_0 I/2R$ (B) $\mu_0 IR/2$
(C) $\mu_0 I/4R$ (D) $\mu_0 I/2\pi R$

Q41. A transformer has 100 primary and 500 secondary turns. With 220 V AC input, the output voltage is
(A) 44 V (B) 1100 V
(C) 220 V (D) 550 V

Q42. The speed of light in a medium of refractive index 1.5 is
(A) 2×10^8 m/s (B) 3×10^8 m/s
(C) 1.5×10^8 m/s (D) 4.5×10^8 m/s

Q43. An object is placed 30 cm in front of a convex lens of focal length 20 cm. The image distance is
(A) −60 cm (B) 60 cm
(C) 12 cm (D) 30 cm

Q44. If the kinetic energy of an electron is made four times, its de Broglie wavelength
(A) is doubled (B) is halved
(C) becomes one-fourth (D) is unchanged

Q45. A radioactive sample has a half-life of 10 days. The fraction left after 30 days is
(A) 1/6 (B) 1/8
(C) 1/4 (D) 1/3

Section B · Numerical value (enter the answer as a number)

Q46. A car starts from rest with acceleration 2 m/s^2. Distance covered in 5 s (in m) is ____.

Q47. The power of a convex lens of focal length 25 cm, in dioptre, is ____.

Q48. A 12 V cell of internal resistance 1 Ω is connected to a 5 Ω resistor. The current (in A) is ____.

Q49. Light of photon energy 5 eV falls on a metal of work function 2 eV. The stopping potential (in V) is ____.

Q50. The gauge pressure at 10 m depth in water ($\rho = 1000$ kg/m^3, $g = 10$ m/s^2) is $x \times 10^4$ Pa. x = ____.

Chemistry

Section A · Multiple choice (one correct option)

Q51. The number of moles in 4.4 g of CO_2 is

(A) 1 (B) 0.2
(C) 0.1 (D) 0.01

Q52. The number of radial nodes in a 3p orbital is

(A) 1 (B) 0
(C) 2 (D) 3

Q53. The shape of SF_4 is

(A) See-saw (B) Square planar
(C) Trigonal bipyramidal (D) Tetrahedral

Q54. The bond order of O_2^+ is

(A) 2.5 (B) 3
(C) 1.5 (D) 2

Q55. For a process at constant temperature and pressure to be spontaneous,

(A) $\Delta G < 0$ (B) $\Delta H < 0$
(C) $\Delta G > 0$ (D) $\Delta S > 0$

Q56. The pH of 0.001 M HCl is

(A) 11 (B) 0.001
(C) 3 (D) 1

Q57. According to Raoult's law, the relative lowering of vapour pressure equals the

(A) molarity of solution (B) molality of solution
(C) mole fraction of solvent (D) mole fraction of solute

Q58. The oxidation state of Cr in $K_2Cr_2O_7$ is

(A) +3 (B) +7
(C) +6 (D) +12

Q59. The unit of the rate constant of a first-order reaction is

(A) $mol\ L^{-1}\ s^{-1}$ (B) $L\ mol^{-1}\ s^{-1}$
(C) s^{-1} (D) $mol^2\ L^{-2}\ s^{-1}$

Q60. The element with the highest electronegativity is

(A) Cl (B) N
(C) O (D) F

Q61. The noble gas that forms the largest number of compounds is

(A) Xe (B) He
(C) Ar (D) Ne

Q62. The spin-only magnetic moment of Fe^{3+} is approximately

(A) 4.90 BM (B) 3.87 BM
(C) 5.92 BM (D) 1.73 BM

Q63. The IUPAC name of $[Co(NH_3)_6]Cl_3$ is
(A) Cobalt hexaammine chloride (B) Hexaamminecobalt(III) chloride
(C) Hexaamminecobalt(II) chloride (D) Hexaamminecobaltate(III) chloride

Q64. In Lassaigne's test, nitrogen is confirmed by the formation of
(A) Prussian blue (B) Black precipitate
(C) Violet colour (D) Blood-red colour

Q65. The most stable carbocation among the following is
(A) $(CH_3)_2CH^+$ (B) $CH_3CH_2^+$
(C) $(CH_3)_3C^+$ (D) CH_3^+

Q66. Addition of HBr to propene (no peroxide) gives mainly
(A) 2-Bromopropane (B) Propane
(C) 1,2-Dibromopropane (D) 1-Bromopropane

Q67. Which alkyl halide reacts fastest by the S_N1 mechanism?
(A) Ethyl bromide (B) tert-Butyl bromide
(C) Methyl bromide (D) Isopropyl bromide

Q68. Phenol reacts with bromine water to give
(A) 4-Bromophenol (B) 2-Bromophenol
(C) Bromobenzene (D) 2,4,6-Tribromophenol

Q69. Hinsberg's reagent is
(A) Benzenesulphonyl chloride (B) Acetyl chloride
(C) Benzoyl chloride (D) $CHCl_3$ + KOH

Q70. On prolonged heating with HI, glucose gives
(A) Sorbitol (B) Saccharic acid
(C) n-Hexane (D) Gluconic acid

Section B · Numerical value (enter the answer as a number)

Q71. The number of σ bonds in ethene (C_2H_4) is ____.

Q72. Volume (in mL) of 0.1 M NaOH needed to neutralise 10 mL of 0.2 M HCl is ____.

Q73. For a first-order reaction with k = 0.0693 min^{-1}, the half-life (in min) is ____.

Q74. The number of unpaired electrons in Mn^{2+} is ____.

Q75. The molar mass of glucose, $C_6H_{12}O_6$ (in g/mol), is ____.

Answer key

Q1 D	**Q2** D	**Q3** B	**Q4** C	**Q5** A
Q6 D	**Q7** C	**Q8** B	**Q9** A	**Q10** C
Q11 B	**Q12** A	**Q13** D	**Q14** A	**Q15** D
Q16 B	**Q17** B	**Q18** D	**Q19** D	**Q20** C
Q21 57	**Q22** 2	**Q23** 10	**Q24** 128	**Q25** 108
Q26 B	**Q27** D	**Q28** A	**Q29** D	**Q30** D
Q31 A	**Q32** A	**Q33** A	**Q34** A	**Q35** B
Q36 A	**Q37** C	**Q38** C	**Q39** A	**Q40** A
Q41 B	**Q42** A	**Q43** B	**Q44** B	**Q45** B
Q46 25	**Q47** 4	**Q48** 2	**Q49** 3	**Q50** 10
Q51 C	**Q52** A	**Q53** A	**Q54** A	**Q55** A
Q56 C	**Q57** D	**Q58** C	**Q59** C	**Q60** D
Q61 A	**Q62** C	**Q63** B	**Q64** A	**Q65** C
Q66 A	**Q67** B	**Q68** D	**Q69** A	**Q70** C
Q71 5	**Q72** 20	**Q73** 10	**Q74** 5	**Q75** 180

Solutions

Q1 · Mathematics · Answer: **(D) −1**
$z = i$, and 2026 leaves remainder 2 on division by 4, so $z^{2026} = i^2 = -1$.

Q2 · Mathematics · Answer: **(D) 19**
$\alpha + \beta = 5$, $\alpha\beta = 3$, so $\alpha^2 + \beta^2 = 25 - 6 = 19$.

Q3 · Mathematics · Answer: **(B) 5**
$|A| = 8 - 3 = 5$ and $|\text{adj } A| = |A|^{n-1} = 5$ for a 2×2 matrix.

Q4 · Mathematics · Answer: **(C) 30**
$5!/(2! \times 2!) = 30$, since L and E each repeat twice.

Q5 · Mathematics · Answer: **(A) 160**
${}^6C_3 \times 2^3 = 20 \times 8 = 160$.

Q6 · Mathematics · Answer: **(D) 9/2**
$a/(1 - r) = 3/(1 - 1/3) = 9/2$.

Q7 · Mathematics · Answer: **(C) 3**
$(\sin 3x)/x = 3 \times (\sin 3x)/(3x) \to 3$.

Q8 · Mathematics · Answer: **(B) 1**
$dy/dx = x^x(1 + \ln x) = 1 \times (1 + 0) = 1$.

Q9 · Mathematics · Answer: **(A) π/4**
Use $\sin^2 x = (1 - \cos 2x)/2$; the integral is $\pi/4$.

Q10 · Mathematics · Answer: **(C) 1/6**
$\int_0^1 (x - x^2)\,dx = 1/2 - 1/3 = 1/6$.

Q11 · Mathematics · Answer: **(B) 6**
Separating variables gives $y = cx$; $c = 2$, so $y(3) = 6$.

Q12 · Mathematics · Answer: **(A) 2**
$|3 + 8 - 1|/\sqrt{(9 + 16)} = 10/5 = 2$.

Q13 · Mathematics · Answer: **(D) 4**
Centre $(2, -3)$; $r^2 = 4 + 9 + 3 = 16$, so $r = 4$.

Q14 · Mathematics · Answer: **(A) (3, 0)**
$y^2 = 4ax$ with $a = 3$, focus $(a, 0) = (3, 0)$.

Q15 · Mathematics · Answer: **(D) π/3**
$\cos\theta = 1/(\sqrt{2} \times \sqrt{2}) = 1/2$, so $\theta = \pi/3$.

Q16 · Mathematics · Answer: **(B) 2**
$|9 - 3|/\sqrt{(1 + 4 + 4)} = 6/3 = 2$.

Q17 · Mathematics · Answer: **(B) 8**
Mean = 6; mean of squares = 44; variance = $44 - 36 = 8$.

Q18 · Mathematics · Answer: **(D) 1/6**
Favourable outcomes: 6 out of 36.

Q19 · Mathematics · Answer: **(D) (√6 + √2)/4**
$\sin(45° + 30°) = (\sqrt{3} + 1)/(2\sqrt{2}) = (\sqrt{6} + \sqrt{2})/4$.

Q20 · Mathematics · Answer: **(C) 30**
$20 + 15 - 5 = 30$.

Q21 · Mathematics · Answer: **57**
$2^6 - 1 - 6 = 57$ (remove the empty set and the 6 singletons).

Q22 · Mathematics · Answer: **2**
$f'(x) = 3x^2 - 3 = 0$ at $x = \pm 1$; $f''(-1) < 0$, $f(-1) = 2$.

Q23 · Mathematics · Answer: **10**
$[x^3 + x]$ from 0 to 2 = 8 + 2 = 10.

Q24 · Mathematics · Answer: **128**
From 105 (7×15) to 994 (7×142): $142 - 15 + 1 = 128$.

Q25 · Mathematics · Answer: **108**
$|a \times b|^2 = |a|^2|b|^2 - (a \cdot b)^2 = 144 - 36 = 108$.

Q26 · Physics · Answer: **(B) $[ML^2T^{-1}]$**
$h = E/\nu$, so $[ML^2T^{-2}]/[T^{-1}] = [ML^2T^{-1}]$.

Q27 · Physics · Answer: **(D) 20 m**
$H = u^2/2g = 400/20 = 20$ m.

Q28 · Physics · Answer: **(A) 40 m**
$R_{max} = u^2/g$ at 45° = 400/10 = 40 m.

Q29 · Physics · Answer: **(D) 4 m/s²**
Friction = $0.2 \times 50 = 10$ N; $a = (30 - 10)/5 = 4$ m/s².

Q30 · Physics · Answer: **(D) 1 J**
$W = \frac{1}{2}kx^2 = \frac{1}{2} \times 200 \times 0.01 = 1$ J.

Q31 · Physics · Answer: **(A) (2/5)MR²**
Standard result for a uniform solid sphere.

Q32 · Physics · Answer: **(A) √2 times**
$v_e = \sqrt{(2GM/R)} \propto 1/\sqrt{R}$.

Q33 · Physics · Answer: **(A) 2×10^{11} Pa**
$Y = FL/(A\Delta L) = (100 \times 2)/(10^{-6} \times 10^{-3}) = 2 \times 10^{11}$ Pa.

Q34 · Physics · Answer: **(A) 40%**
$\eta = 1 - 300/500 = 0.4$.

Q35 · Physics · Answer: **(B) 2 times**
$v_{rms} \propto \sqrt{T}$.

Q36 · Physics · Answer: **(A) 1 s**
$\omega = 2\pi$ rad/s, so $T = 2\pi/\omega = 1$ s.

Q37 · Physics · Answer: **(C) 9×10^{-3} N**
$F = 9 \times 10^{9} \times 10^{-6} \times 10^{-6}/1 = 9 \times 10^{-3}$ N.

Q38 · Physics · Answer: **(C) 1.2 µF**
$C = (2 \times 3)/(2 + 3) = 1.2$ µF.

Q39 · Physics · Answer: **(A) 2 Ω**
$1/R = 3/6$, so $R = 2$ Ω.

Q40 · Physics · Answer: **(A) $\mu_0 I/2R$**
Biot–Savart law for a full loop.

Q41 · Physics · Answer: **(B) 1100 V**
$V_s = V_p \times N_s/N_p = 220 \times 5$.

Q42 · Physics · Answer: **(A) 2×10^{8} m/s**
$v = c/n = 3 \times 10^{8}/1.5$.

Q43 · Physics · Answer: **(B) 60 cm**
$1/v - 1/u = 1/f$ with $u = -30$: $1/v = 1/20 - 1/30 = 1/60$.

Q44 · Physics · Answer: **(B) is halved**
$\lambda = h/\sqrt{(2mK)} \propto 1/\sqrt{K}$.

Q45 · Physics · Answer: **(B) 1/8**
30 days = 3 half-lives: $(1/2)^3$.

Q46 · Physics · Answer: **25**
$s = \frac{1}{2}at^2 = \frac{1}{2} \times 2 \times 25 = 25$ m.

Q47 · Physics · Answer: **4**
$P = 1/f$ (in m) $= 1/0.25 = 4$ D.

Q48 · Physics · Answer: **2**
$I = E/(R + r) = 12/6 = 2$ A.

Q49 · Physics · Answer: **3**
$K_{max} = 5 - 2 = 3$ eV, so $V_0 = 3$ V.

Q50 · Physics · Answer: **10**
$P = \rho gh = 1000 \times 10 \times 10 = 10^{5}$ Pa $= 10 \times 10^{4}$ Pa.

Q51 · Chemistry · Answer: **(C) 0.1**
Molar mass of $CO_2 = 44$ g/mol; $4.4/44 = 0.1$.

Q52 · Chemistry · Answer: **(A) 1**
Radial nodes $= n - l - 1 = 3 - 1 - 1 = 1$.

Q53 · Chemistry · Answer: **(A) See-saw**
4 bond pairs + 1 lone pair (sp^3d): see-saw.

Q54 · Chemistry · Answer: **(A) 2.5**
$(10 - 5)/2 = 2.5$ using MO theory.

Q55 · Chemistry · Answer: **(A) ΔG < 0**
Gibbs energy must decrease.

Q56 · Chemistry · Answer: **(C) 3**
$[H^+] = 10^{-3}$ M, so pH = 3.

Q57 · Chemistry · Answer: **(D) mole fraction of solute**
$(p° - p)/p° = x_{solute}$.

Q58 · Chemistry · Answer: **(C) +6**
2(+1) + 2x + 7(−2) = 0, so x = +6.

Q59 · Chemistry · Answer: **(C) s^{-1}**
For first order, k = rate/[A] has unit $time^{-1}$.

Q60 · Chemistry · Answer: **(D) F**
Fluorine (4.0 on the Pauling scale).

Q61 · Chemistry · Answer: **(A) Xe**
Lowest ionisation enthalpy among stable noble gases (e.g. XeF_2, XeF_4, XeO_3).

Q62 · Chemistry · Answer: **(C) 5.92 BM**
$3d^5$: 5 unpaired electrons; √(5 × 7) = √35 ≈ 5.92 BM.

Q63 · Chemistry · Answer: **(B) Hexaamminecobalt(III) chloride**
Cationic complex, Co is +3; '-ate' is used only for anionic complexes.

Q64 · Chemistry · Answer: **(A) Prussian blue**
$Fe_4[Fe(CN)_6]_3$ (Prussian blue).

Q65 · Chemistry · Answer: **(C) $(CH_3)_3C^+$**
Tertiary carbocation: maximum hyperconjugation and +I effect.

Q66 · Chemistry · Answer: **(A) 2-Bromopropane**
Markovnikov's rule: Br goes to the more substituted carbon.

Q67 · Chemistry · Answer: **(B) tert-Butyl bromide**
Forms the most stable (tertiary) carbocation.

Q68 · Chemistry · Answer: **(D) 2,4,6-Tribromophenol**
–OH strongly activates the ring; in water all o/p positions are brominated.

Q69 · Chemistry · Answer: **(A) Benzenesulphonyl chloride**
$C_6H_5SO_2Cl$ distinguishes 1°, 2° and 3° amines.

Q70 · Chemistry · Answer: **(C) n-Hexane**
Shows the six carbons are in a straight chain.

Q71 · Chemistry · Answer: **5**
4 C–H + 1 C–C σ bond (plus one π bond).

Q72 · Chemistry · Answer: **20**
$M_1V_1 = M_2V_2$: 0.2 × 10 = 0.1 × V.

Q73 · Chemistry · Answer: **10**
$t_{1/2} = 0.693/k = 10$ min.

Q74 · Chemistry · Answer: **5**
Mn^{2+} is $3d^5$.

Q75 · Chemistry · Answer: **180**
6(12) + 12(1) + 6(16) = 180.