Institute of Actuaries of India

ACET June 2026 Solutions

Q.1 Minimum value of f(x) = $|3x^2 – 6x + 5|$

The expression inside is $g(x) = 3x^2 – 6x + 5 = 3(x–1)^2 + 2$. Since $3(x–1)^2 \geq 0$, the minimum of g(x) is 2 at x = 1. Since g(1) = 2 > 0, the absolute value does not change it. So min f(x) = 2.

Answer: A (2)

Q.2 f(x) = $x^3 – 6x^2 + 9x + 2$ strictly decreasing on:

$f'(x) = 3x^2 – 12x + 9 = 3(x–1)(x–3)$. $f'(x) < 0$ when $1 < x < 3$. So f is strictly decreasing on (1, 3).

Answer: A (1, 3)

Q.3 Number of real roots of $2x^3 + 3x + 5 = 0$

Let $f(x) = 2x^3 + 3x + 5$. Then $f'(x) = 6x^2 + 3 > 0$ for all x. So f is strictly increasing, and a strictly monotone cubic has exactly one real root. Check: f(0) = 5 > 0, f(–1) = –2 + (–3) + 5 = 0. So x = –1 is the only real root.

Answer: C (Exactly 1 real root)

Q.4 General term: T(r+1) = C(5,r) · x^(5−r) · 2^r

For x^3 → 5 − r = 3 → r = 2

Coefficient = $C(5,2) \cdot 2^2 = 10 \cdot 4 =$ **40**

Answer: B) 40

Q.5 lim(x→0) [sin(5x) – sin(3x)] / x

Using the standard limit lim(x→0) sin(kx)/x = k: [sin(5x) – sin(3x)] / x → 5 – 3 = 2.

Answer: A (2)

Q.6 Equation with roots a^2, b^2 when a, b are roots of $x^2 – 8x + 15 = 0$

From the original: a + b = 8, ab = 15. New sum = $a^2 + b^2 = (a+b)^2 – 2ab = 64 – 30 = 34$. New product = $a^2b^2 = (ab)^2 = 225$. New equation: $x^2 – 34x + 225 = 0$.

Answer: A ($x^2 – 34x + 225 = 0$)

Q.7 Unit vector in direction of $\vec{v} = 5i + 12j$

$|v| = \sqrt{(25 + 144)} = \sqrt{169} = 13$. Unit vector = (5/13)i + (12/13)j.

Answer: A ((5/13)i + (12/13)j)

Q.8 Distributive laws for dot and cross products

Both the dot product and cross product are distributive over addition.

Statement X: a · (b + c) = a·b + a·c — TRUE.

Statement Y: a × (b + c) = a×b + a×c — TRUE.

So both hold.

Answer: C (Both X and Y)

Q.9 |2A| for 3×3 matrix A with |A| = 4

For an n×n matrix, |kA| = k^n · |A|. Here n = 3, k = 2: $|2A| = 2^3 \cdot 4 = 8 \cdot 4 = 32$.

Answer: C (32)

Q.10 adj(adj(M)) for 3×3 matrix M

For an n×n invertible matrix, adj(adj(M)) = |M|^(n–2) · M. For n = 3: adj(adj(M)) = |M|^1 · M = |M| · M.

Answer: B (|M| · M)

Q.11 $1 + \omega + \omega^2$ for cube root of unity $\omega \neq 1$

A fundamental property of the cube roots of unity: $1 + \omega + \omega^2 = 0$.

Answer: B (0)

Q.12 |z| where z = (2 + 3i)(1 – i)

Using $|z_1 z_2| = |z_1||z_2|$: $|2 + 3i| = \sqrt{(4+9)} = \sqrt{13}$. $|1 - i| = \sqrt{(1+1)} = \sqrt{2}$. So $|z| = \sqrt{13} \cdot \sqrt{2} = \sqrt{26}$.

Answer: B (√26)

Q.13 Trapezoidal rule with h = 0.5 for $\int_0^2 (x^3 + 1)\,dx$

Points: 0, 0.5, 1, 1.5, 2. $f(x) = x^3+1$ values: f(0)=1, f(0.5)=1.125, f(1)=2, f(1.5)=4.375, f(2)=9. $T = (0.5/2)[1 + 2(1.125+2+4.375) + 9] = 0.25[1 + 2(7.5) + 9] = 0.25[1+15+9] = 0.25 \cdot 25 = 6.25$. B matches (exact = $[x^4/4+x]_0^2 = 4+2 = 6$). The computed value is 6.25.

Answer: B (6.25)

Q.14 Newton–Raphson: solve $x^2 - 7 = 0$ with $x_0 = 3$

$f(x) = x^2 - 7$, $f'(x) = 2x$. $x_1 = x_0 - f(x_0)/f'(x_0) = 3 - (9-7)/6 = 3 - 2/6 = 3 - 0.333... = 2.667 \approx 2.67$.

Answer: A (2.67)

Q.15 dy/dx at x = 0 given $e^x = \cos y$

Differentiate: $e^x = -\sin(y) \cdot dy/dx$. So $dy/dx = -e^x / \sin(y)$. At x = 0: $e^0 = 1$, so cos y = 1, y = 0. sin(0) = 0. The derivative is undefined (denominator is 0). None of the listed values apply.

Answer: D (None of the above — derivative is undefined at x = 0)

Q.16 Common ratio of GP with $a_4 = 24$ and $a_7 = 3$

$a_7/a_4 = r^3 = 3/24 = 1/8$. So r = (1/8)^(1/3) = 1/2.

Answer: A (1/2)

Q.17 Evaluate between the limits 0 and π.

Let I = , limits 0 to π.

Using integration by parts:

Let u = x → du = dx

Let dv = sin(x) dx → v = −cos(x)

So:

I = , evaluated from 0 to π

I = [−x·cos(x) + sin(x)] from 0 to π

Substituting limits:

I = (−π·cos π + sin π) − (−0·cos 0 + sin 0)

I = (−π·(−1) + 0) − (0 + 0)

I = π

Answer: B

Q.18 Evaluate: $\int_0^1 x \cdot e^x dx$

Integration by parts: u = x, dv = e^x dx.

Then $du = dx, v = e^x . xe^x dx = [xe^x]_0^1 - \int_0^1 e^x \, dx = e - [e^x]_0^1 = e - (e - 1) = 1.$

So the answer is A (1)

Q.19 Value of $1^2 + 2^2 + 3^2 + ... + 20^2$ is:

Using the standard formula: sum of squares of first n natural numbers = n(n+1)(2n+1) / 6

Here n = 20:

= 20 × 21 × 41 / 6

= 17220 / 6

= 2870

Answer: A

Q.20 Local minimum of $f(x) = x^4 – 4x^3 + 6$

$f'(x) = 4x^3 – 12x^2 = 4x^2(x–3)$. Critical points: x = 0 and x = 3. $f''(x) = 12x^2 – 24x$. $f''(0) = 0$ (inconclusive — check sign change: $f'(x) = 4x^2(x–3)$ is negative for $x < 3$ ($x \neq 0$), so x=0 is not a local min). $f''(3) = 108 – 72 = 36 > 0$, so x = 3 is a local minimum.

Answer: C (x = 3)

Q.21 Outcomes are 1, 2, 3, 4 each with probability 1/4. With an even number of equally likely outcomes, the median is the average of the two middle values: (2+3)/2 = 2.5.

Answer: B (2.5)

Q.22 Distribution shape given mean = 50, median = 48, mode = 45

When mean > median > mode, the distribution is positively skewed (right-skewed). The longer tail is on the right.

Answer: C (Positively skewed)

Q.23 5-member team from 6 boys and 4 girls with at least 2 girls

Cases: (2 girls, 3 boys) = C(4,2)·C(6,3) = 6·20 = 120. (3 girls, 2 boys) = C(4,3)·C(6,2) = 4·15 = 60. (4 girls, 1 boy) = C(4,4)·C(6,1) = 1·6 = 6. Total = 120 + 60 + 6 = 186.

Answer: C (186)

Q.24 Combined mean of Batch X (n=30, mean=60) and Batch Y (n=20, mean=75)

Combined mean = (30×60 + 20×75) / (30+20) = (1800 + 1500) / 50 = 3300/50 = 66.

Answer: B (66)**

Q.25 P(A|B) given P(A)=0.4, P(B)=0.6, P(A∪B)=0.76

$P(A \cap B) = P(A) + P(B) – P(A \cup B) = 0.4 + 0.6 – 0.76 = 0.24$. $P(A|B) = P(A \cap B)/P(B) = 0.24/0.6 = 0.4$. Since 0.4 = 2/5, this is not in the given options A–C (1/6, 1/4, 1/3). None of the above.

Answer: D (None of the above — P(A|B) = 2/5 = 0.4)

Q.26 E[Y] for coin-then-die experiment (4-sided die)

If Heads: E[Y|H] = (1+2+3+4)/4 = 2.5. If Tails: E[Y|T] = 2×2.5 = 5. E[Y] = 0.5×2.5 + 0.5×5 = 1.25 + 2.5 = 3.75.

Answer: A (3.75)

Q.27 IQR of X ~ Uniform(–1, 3)

For Uniform(a,b): Q1 = a + 0.25(b–a), Q3 = a + 0.75(b–a). Here a=–1, b=3, b–a=4. Q1=–1+1=0, Q3=–1+3=2. IQR = Q3–Q1 = 2.

Answer: B (2)

Q.28 P(T > 10) for Exp(mean=5)

Rate λ = 1/5. P(T > t) = e^(–t/5). P(T > 10) = e^(–10/5) = e^(–2).

Answer: A (e^(–2))

Q.29 Std dev of Y = 3X + 2 where X ~ N(5, 16)

Var(X) = 16, so SD(X) = 4. Var(Y) = 3^2·Var(X) = 9·16 = 144. SD(Y) = 12.

Answer: A (12)

Q.30 A fair coin is tossed 8 times. The probability of getting exactly 5 heads is:

X ~ Binomial(n=8, p=1/2)

$P(X = 5) = C(8,5) \cdot (1/2)^5 \cdot (1/2)^3$

$= C(8,5) \cdot (1/2)^8$

$= 56 \cdot (1/256)$

$= 56/256$

$= 7/32$

Answer: A (7/32)

Q.31 λ for Poisson where P(X=2) = P(X=3)

e^(–λ)$\lambda^2/2!$ = e^(–λ)$\lambda^3/3!$. Cancel common factor: $1/2 = \lambda/6 \implies \lambda = 3$.

Answer: B (3)

Q.32 Variance of X (exponential) given P(X>3)/P(X>6) = e^(3/2)

P(X>t) = e^(–t/θ). Ratio = e^(–3/θ)/e^(–6/θ) = e^(3/θ) = e^(3/2). So $3/\theta = 3/2 \implies \theta = 2$. Variance = $\theta^2 = 4$.

Answer: B (4)

Q.33 P(X is even) from given CDF

PMF: P(0)=0.15, P(1)=0.30, P(2)=0.30, P(3)=0.20, P(4)=0.05. Even values: 0, 2, 4.

P(even) = 0.15+0.30+0.05 = 0.50.

Answer: B (0.50)

Q.34 Median of X from same CDF

Median = smallest x with F(x) ≥ 0.5. F(1) = 0.15+0.30 = 0.45 < 0.5. F(2) = 0.75 ≥ 0.5. So median = 2.

Answer: B (2)

Q.35 Mode of stem-and-leaf data

Data: 15, 18, 22, 25, 25, 29, 30, 33, 37, 37, 37, 41, 44, 46, 48, 48, 50, 50, 52. Frequencies: 25→2, 37→3, 48→2, 50→2. The value 37 appears 3 times — it is the unique mode.

Answer: A (The dataset has a unique mode of 37)

Q.36 Correlation coefficient: 3Y – 2X + 4 = 0, s_x=3, s_Y=2

Rewrite as Y = (2/3)X – 4/3. Slope b_{Y|X} = 2/3. Formula: b_{Y|X} = ρ · (sy/s_x) = ρ · (2/3). So ρ = (2/3) ÷ (2/3) = 1. Since |ρ|=1 ≤ 1, this is valid. ρ = 1.

Answer: B (ρ = 1)

Q.37 ρ^2 given two regression lines Y = 2X+1 and X = 0.4Y+0.5

b_{Y|X} = 2, b_{X|Y} = 0.4. ρ^2 = b_{Y|X} · b_{X|Y} = 2 × 0.4 = 0.8.

Answer: A (0.8)

Q.38 Cov(X, X^2) for fair 6-sided die

E[X] = 3.5. E[X^2] = (1+4+9+16+25+36)/6 = 91/6. E[X^3] = (1+8+27+64+125+216)/6 = 441/6 = 73.5. Cov(X,X^2) = E[X^3] – E[X]·E[X^2] = 73.5 – 3.5×(91/6) = 73.5 – 318.5/6 = 73.5 – 53.083... = 20.417. Option D matches 20.42 (The question uses 6-sided die so answer is D).

Answer: D (Cov = 245/12 ≈ 20.42 for 6-sided die)

Q.39 Independence: P(A)=0.5, P(B)=0.6, P(A∩B)=0.30

Check X: P(A)P(B) = 0.5×0.6 = 0.30 = P(A∩B) ✓ Independent. Check Y: P(B^c)=0.4. P(A∩B^c) = P(A)–P(A∩B)=0.5–0.30=0.20. P(A)P(B^c)=0.5×0.4=0.20 ✓ Independent. Both X and Y are true.

Answer: A (Both X and Y)

Q.40 Expected winnings on biased 4-sided spinner

Weights: k=1→1, k=2→2, k=3→3, k=4→4. Total = 10. P(k) = k/10. E[winnings] = Σ k·(k/10) = Σ k^2/10 = (1+4+9+16)/10 = 30/10 = 3.

Answer: B (3)

Q.41 Total units sold in March

March sales: North=55, South=65, East=45, West=50. Total = 55+65+45+50 = 215 (thousands).

Answer: C (215)

Q.42 Largest absolute increase in sales from January to April

North: 60–45=+15. South:70 –60=+10. East: 40–35=+5. West: 55–50=+5. North shows the highest with + 15. North is A and is the correct choice here.

Answer: A (North — increase of 15 thousand units)

Q.43 Total profit in May using profit margins

May sales: North=65, South=60, East=50, West=70 (thousands). Margins: N=18%, S=22%, E=15%, W=20%. Profits: N=65×0.18=11.7, S=60×0.22=13.2, E=50×0.15=7.5, W=70×0.20=14.0. Total=11.7+13.2+7.5+14.0=46.4.

Answer: D (Total = 46.4 thousand)

Q.44 Month with highest combined sales

Jan:45+60+35+50=190. Feb:50+55+40+60=205. Mar:55+65+45+50=215. Apr:60+70+40+55=225. May:65+60+50+70=245. Highest is May.

Answer: D (May)

Q.45 Month with smallest temperature gap between City P and Q

Differences: Jan:20–12=8, Feb:21–14=7, Mar:24–18=6, Apr:26–23=3, May:27–28=–1 (Q < P), Jun:29–32=–3. The absolute gap is smallest in April (3°C) or May (1°C). May has the smallest gap of 1°C.

Answer: C (May)

Q.46 First month City P exceeds City Q

Temperatures: Jan P=12<Q=20, Feb P=14<Q=21, Mar P=18<Q=24, Apr P=23<Q=26, May P=28>Q=27. City P first exceeds City Q in May.

Answer: D (May)

Q.47 Sharpest month-on-month increase for City P

City P changes: Jan→Feb: +2, Feb→Mar: +4, Mar→Apr: +5, Apr→May: +5, May→Jun: +4. The sharpest increase is +5°C, occurring in both Mar–Apr and Apr–May. The first occurrence is Mar–Apr.

Answer: C (Mar–Apr)

Q.48 Month with highest combined temperature

Combined: Jan=32, Feb=35, Mar=42, Apr=49, May=55, Jun=61. Highest is June.

Answer: C (June)

Q.49 Department with highest average attendance

Commerce: (88+85+87+90)/4=350/4=87.5. Science: (76+80+78+82)/4=316/4=79.0. Arts: (91+89+93+92)/4=365/4=91.25. Law: (84+88+86+85)/4=343/4=85.75. Highest is Arts.

Answer: C (Arts)

Q.50 Department with lowest attendance

Commerce : 85% in February

Science : 76% in January

Arts : 89% in February

Law : 84% in January

Science has the lowest with 76% in January

Q.51 Department with highest gap in attendance (largest range)

Ranges: Commerce: 90–85=5. Science: 82–76=6. Arts: 93–89=4. Law: 88–84=4.

Science is highest with 6% range difference

Answer: B (Science)

Q.52 Best word: 'The scientist's _____ research led to a breakthrough.'

'Diligent' means hardworking and careful — perfectly fitting for research leading to a breakthrough. The other options (superficial, erratic, negligent) imply carelessness.

Answer: B (diligent)

Q.53 Synonym of 'verbose'

'Verbose' means using more words than necessary — i.e., wordy.

Answer: B (wordy)

Q.54 Opposite of 'benevolent'

'Benevolent' means kind and generous. Its antonym is 'malevolent' — wishing evil upon others.

Answer: C (malevolent)

Q.55 Error in: 'Neither of the students have submitted their assignment on time.'

'Neither' is singular and takes a singular verb. The error is 'have submitted' — it should be 'has submitted'.

Answer: B (have submitted)

Q.56 Fill in: 'The committee reached a _____ after hours of debate.'

'Consensus' means a general agreement reached by a group — exactly what a committee achieves after debate.

Answer: A (consensus)

Q.57 person who hates mankind is called a _____.

A 'misanthrope' is a person who dislikes humankind and avoids human society.

Answer: B (misanthrope)

Q.58 Meaning of 'beats around the bush'

This idiom means avoiding the main point or topic — talking around it without addressing it directly.

Answer: B (Avoiding the main topic)

Q.59 Doctor : Stethoscope :: Carpenter : ?

A doctor uses a stethoscope as their primary professional tool. A carpenter's primary tool is a hammer.

Answer: A (Hammer)

Q.60 Which is NOT a valid inference from the renewable energy passage?

The passage says critics argue renewable energy 'cannot yet reliably meet peak demand', which directly contradicts option C ('already fully capable'). C is not a valid inference.

Answer: C ('Renewable energy is already fully capable of meeting all energy demands' — not supported)

Q.61 Correct sequence of jumbled sentences

Logical order: II (customers complained about cost) → III (sales dropped) → IV (management ordered review) → I (this led to revision of pricing strategy). Sequence: II, III, IV, I.

Answer: A (II, III, IV, I)

Q.62 Which sentences are erroneous?

I: 'more smarter' is doubly comparative — should be 'smarter'. II: 'refused accepting' should be 'refused to accept'. III: 'worked hardly' should be 'worked hard' (hardly means 'barely'). All three are erroneous.

Answer: D (I, II and III — all three)

Q.63 Year when 15th August again falls on Thursday (given 2024 = Thursday)

Normal year: +1 day. Leap year: +2 days (for dates after Feb 29). Leap years: 2028, 2032, 2036. 2024=Thu. 2025:+1=Fri. 2026:+1=Sat. 2027:+1=Sun. 2028(L):+2=Tue. 2029:+1=Wed. 2030:+1=Thu ✓. The answer is 2030.

Answer: A (2030)

Q.64 How many times do hands form a straight line between 6:00 and 7:00 p.m.?

The hands are in a straight line (180°) once per hour. Between 6:00 and 7:00 p.m., the hands form a straight line exactly once (at approximately 6:32).

Answer: B (1)

Q.65 Cubes with exactly 2 painted faces in a 4×4×4 cube cut into 1×1×1 pieces

Cubes with paint on exactly 2 faces are the edge cubes (excluding corners). A 4×4×4 cube has 12 edges. Each edge of a 4-cube has 4–2=2 non-corner cubes. So total = 12×2 = 24.

Answer: B (24)

Q.66 If A is C's mother's brother's daughter, then C is A's:

C's mother's brother is C's maternal uncle. His daughter is C's cousin. So A is C's cousin, and C is also A's cousin.

Answer: B (Cousin)

Q.67 Seating arrangement: 6 students, F at left end, D immediately right of C, A right of D

F is at position 1. C–D must be consecutive. A is to the right of D. B is to the right of A. In all valid arrangements, D's only left neighbour is C, B is to the right of A, which is to the right of D. So B cannot sit next to D (B must be placed elsewhere). Option C ('B does not sit next to D') must be true.

Answer: C (B does not sit next to D

Q.68 Syllogism: All pilots are engineers; Some engineers are doctors; No doctor is a teacher

From (2): Some engineers are doctors. From (3): No doctor is a teacher. Therefore, those engineers who are doctors are not teachers. So 'Some engineers are not teachers' is definitely true.

Answer: C (Some engineers are not teachers)

Q.69 Logical sequence: Recruitment, Training, Appraisal, Promotion

Natural order of employment cycle: Interview (I) → Recruitment (R) → Training (T) → Promotion (P).

Answer: A (I, R, T, P)

Q.70 Wrong number in series: 2, 5, 11, 23, 47, 96, 191

Pattern: ×2+1 each time. 2→5(×2+1)✓, 5→11(×2+1)✓, 11→23(×2+1)✓, 23→47(×2+1)✓, 47→95(×2+1)=95, but series shows 96 ✗. Then 95→191(×2+1)✓. So the wrong number is 96 (should be 95).

Answer: C (96 — should be 95)

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