F.6 Mathematics 2025 Mock Exam Paper I & II

Paper 2

Question No.	Key	Question No.	Key
1.	C	26.	D
2.	C	27.	A
3.	A	28.	C
4.	A	29.	C
5.	D	30.	B
6.	C	31.	B
7.	A	32.	B
8.	B	33.	A
9.	B	34.	D
10.	C	35.	D
11.	A	36.	D
12.	D	37.	B
13.	A	38.	C
14.	C	39.	C
15.	D	40.	D
16.	D	41.	B
17.	D	42.	C
18.	B	43.	D
19.	D	44.	D
20.	B	45.	A
21.	C		
22.	D		
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24.	A		
25.	A		

F.6 Mathematics 2025 Mock Exam Paper I & II

Section A

1. C

$$\frac{a^{n-1}+a^{n-3}}{a^{n-2}}=\frac{a^{n-2}(a+a^{-1})}{a^{n-2}}=a+a^{-1}=a+\frac{1}{a}$$

2. C

$$\frac{a-b}{a}=\frac{1}{b+2}-1$$

$$\frac{a-b}{a}+1=\frac{1}{b+2}$$

$$\frac{2a-b}{a}=\frac{1}{b+2}$$

$$(2a-b)(b+2)=a$$

$$2a(b+2)-b(b+2)=a$$

$$a[2(b+2)-1]=b(b+2)$$

$$a=\frac{b(b+2)}{2(b+2)-1}$$

$$a=\frac{b^2+2b}{2b+3}$$

3. A

$$\begin{aligned}4p^2-12pq-36+9q^2&=4p^2-12pq+9q^2-36\\&=(2p-3q)^2-6^2\\&=(2p-3q+6)(2p-3q-6)\end{aligned}$$

4. A

$$\begin{cases}3x-2y=1 & ......(1)\\-4x+3y= & ......(2)\end{cases}$$

By solving, we have $x = 5$, $y = 7$

Thus, $y - x = 7 = 7 - 5 = 2$

5. D

$x^2 + ax - b \equiv (x+b)(x-1) + bx$

$x^2 + ax - b \equiv x^2 + (b-1)x - b + bx$

$x^2 + ax - b \equiv x^2 + (2b-1)x - b$

By comparing two sides, we have $a = 2b - 1$.

$a - 2b = -1$

Thus, $2a - 4b = 2(a-2b) = 2(-1) = -2$

6. C

$(11.5)(7.5) \le A < (12.5)(8.5)$

$86.25 \le A < 106.25$

7. A

$f(3x + 1) = 3x^2 - 7x + 2$

$f(5) = f(3 \cdot \frac{4}{3} + 1)$

$= 3\left(\frac{4}{3}\right)^2 - 7\left(\frac{4}{3}\right) + 2$

$= -2$

8. B

Let c be the age of Cathy.

The age of Billy = $(1 - 50\%)c = 0.5c$

The age of Alice = $(1 + 20\%)(0.5c) = 0.6c$

$0.5c + c = 75$

$1.5c = 75$

$c = 50$

The required sum

$= 50 + 0.5(50) + 0.6(50)$

$=105$

9. B

$y = 15 - 9\left(x - \frac{5}{3}\right)^2$

Note that the coefficient of x^2 is –9.

So, the graph opens downwards.

Thus, A is wrong.

$y = 15 - 9\left(x - \frac{5}{3}\right)^2 = -9\left(x - \frac{5}{3}\right)^2 + 15$

Note that the coordinates of the vertex $= \left(\frac{5}{3}, 15\right)$

Thus, B is the answer.

10. C

$Q(4, 5 + 1) = Q(4, 6)$

11. A

By remainder theorem, the remainder

= f(–2 + 1)

= f(–1)

$= (-1)^3 - 5(-1)^2 + (-1) + 3$

= –1 – 5 – 1 + 3

= –4

12. D

Note that $kx + 7y + 9 = 0$ and $kx - 7y + k = 0$ are perpendicular to each other.

So, $-\frac{k}{7} \times \frac{k}{7} = -1$

$k^2 = 49$

$k = 7$ or -7

13. A

$z^2 \propto \frac{y}{\sqrt{x}}$

$y \propto z^2\sqrt{x}$

The percentage change

$= [(1 + 50\%)^2\sqrt{(1 - 36\%)} - 1] \times 100\%$

$= 80\%$

14. C

$a_{n+2} = a_{n+1} + 2a_n$

$a_6 = a_5 + 2a_4$

$58 = a_5 + 2(15)$

$a_5 = 28$

Thus, $a_7 = a_6 + 2a_5 = 58 + 2(28) = 114$

15. D

The volume of B

$= \left(\frac{12}{3}\right)^3 \times 12\pi$

$= 768\pi \text{ cm}^3$

16. D

$\Delta TUV \sim \Delta SPV$ (AAA)

$\frac{TU}{SP} = \frac{UV}{PV} = \frac{1}{2}$

Area of ΔSPV

$= \left(\frac{2}{1}\right)^2 \times 2$

$= 8 \text{ cm}^2$

Area of ΔSUV

$=$ Area of ΔPTV

$= 2 \times 2$

$= 4 \text{ cm}^2$

Area of ΔPQT + Area of ΔSUR

$= 3 \times$ Area of ΔPTU

$= 3 \times (2 + 4)$

$= 18 \text{ cm}^2$

Thus, the required area

$= (18 + 6 + 4 + 8)$

$= 36 \text{ cm}^2$

17. D

$\angle OCA = \angle OAC$ (base. $\angle$s, isos. Δ)

$= \angle ACB$ (alt. $\angle$s, $OA // BC$)

$\angle OBC = \angle OCB$ (base. $\angle$s, isos. Δ)

In ΔOBC,

$\angle BOC + \angle OCB + \angle OBC = 180^{\circ}$ ($\angle$ sum of Δ)

$\angle BOC + 2\angle OCB = 180^{\circ}$

$\angle BOC + 2(2\angle OCA) = 180^{\circ}$

$\angle BOC + 4\angle OCA = 180^{\circ}$

In ΔOCD,

$\angle BOC + \angle OCA = 105^{\circ}$ (ext. $\angle$ of Δ)

Thus, $3\angle OCA = 180^{\circ} - 105^{\circ}$

$OCA = 25^{\circ}$

$\angle BOC = 105^{\circ} - 25^{\circ} = 80^{\circ}$

The required area

$= \pi(12)^2 \times \frac{80^{\circ}}{360^{\circ}}$

$= 32\pi \text{ cm}^2$

18. B

$AB = BC$ & $AE = EF$

$BEG // FC$ and $CF = 2BE$ (mid-pt thm.)

$DC = CB$ & $FC // GB$

$DF = FG$ (intercept thm.)

$DC = CB$ & $DF = FG$

$BG = 2CF$ (mid-pt thm.)

So,

$CF = 2BE$

$BG = 2CF = 2(2BE) = 4BE$

Thus, $BE : EG = 1 : (4 - 1) = 1 : 3$

19. D

$\angle BAF = \angle AFE = \angle FED = \angle EDC = \dfrac{(6-2)\times 180^\circ}{6} = 120^\circ$

$\angle FAE = \angle FEA = \dfrac{180^\circ - 120^\circ}{2} = 30^\circ$

$\angle EFD = \angle EDF = \dfrac{180^\circ - 120^\circ}{2} = 30^\circ$

Since $\angle EFD = \angle FEA = 30^\circ$, so that $GE = GF$.

Thus, I is true.

$\angle DEG = \angle AFG = 90^\circ$

$GE = GF$

$DE = AF$

So, $\triangle DEG \cong \triangle AFG$ (SAS)

$DG = AG$ (corr. sides, $\cong \triangle$s)

$\angle BAG = \angle CDG = 90^\circ$

$BA = CD$

So, $\triangle BAG \cong \triangle CDG$ (SAS)

$BG = CG$ (corr. sides, $\cong \triangle$s)

Thus, II is true.

$\sin \angle FAG = \dfrac{FG}{AG}$

$\sin 30^\circ = \dfrac{FG}{GD}$

$\dfrac{FG}{GD} = \dfrac{1}{2}$

So, $FG : GD = 1 : 2$

Thus, III is true.

20. B

Note that $\Delta ABC \sim \Delta ACD$.

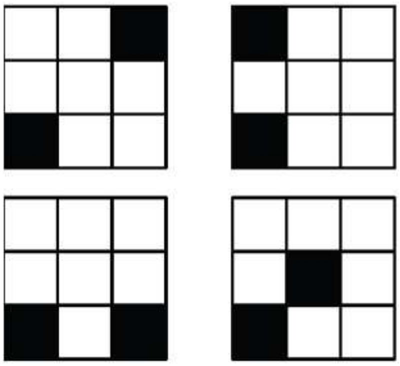
$\angle BAC = \angle CAD = \alpha$

$\angle ABC = \angle ACD = 90^\circ$

$AC = \dfrac{AB}{\cos\alpha} = \dfrac{1}{\cos\alpha}$

$CD = \tan\alpha \cdot \dfrac{1}{\cos\alpha} = \dfrac{\sin\alpha}{\cos\alpha} \cdot \dfrac{1}{\cos\alpha} = \dfrac{\sin\alpha}{\cos^2\alpha}$

21. C



22. D

An exterior angle = $\frac{360°}{n}$

An interior angle = $\frac{4 \times 360°}{n} = \frac{1440°}{n}$

$$\frac{360°}{n} + \frac{1440°}{n} = 180°$$
$$n = 10$$

Thus, I is true.

Number of reflectional symmetry

= 10

Thus, II is false.

Number of diagonals

$= C_2^{10} - 10$

$= 35$

Thus, III is true.

23. B

$AH^2 = (24\sqrt{5})^2 - 24^2$

$AH = 48$

Radius $= \dfrac{48+12}{2} = 30$

Let $OH : FD = 1 : k$.

$FD = 18k$

$HG = \dfrac{15}{1+k}$; $OG = \dfrac{30}{1+k}$

$OH^2 + HG^2 = OG^2$

$18^2 + \left(\dfrac{15}{1+k}\right)^2 = \left(\dfrac{30}{1+k}\right)^2$

$k = \dfrac{5}{\sqrt{12}} - 1$

$FD = 18k = 7.980762114$

$\angle DBF = \tan^{-1}\left(\dfrac{FD}{FB}\right)$

$= 11.56505118°$

$\angle ABH = \tan^{-1}\left(\dfrac{AH}{HB}\right)$

$= 63.43494882°$

$\angle ABD = \angle DBF + \angle ABH$

$= 75°$

24. A

Area of $\triangle ABC$.

= Area of $\triangle BOC$ + Area of $\triangle AOB$

$= \dfrac{1}{2}(3)(4)\sin 30° + \dfrac{1}{2}(2)(3)\sin 150°$

$= 4.5$

25. A

Slope of the locus of $P = -\frac{2}{3}$

y-intercept of $L_1 = -\frac{10}{3}$

y-intercept of $L_2 = -\frac{14}{9}$

y-intercept of the locus of $P = -\frac{14}{9} - [\frac{-\frac{14}{9} - (-\frac{10}{3})}{4}] = -2$

The required equation

$y = -\frac{2}{3}x - 2$

$2x + 3y + 6 = 0$

26. D

Slope of L_1 < Slope of L_2

$-\frac{a}{b} < -\frac{m}{n}$

$\frac{a}{b} > \frac{m}{n}$

Thus, I is true.

$0 <$ x-intercept of L_1 < x-intercept of L_2

$0 < \frac{1}{a} < \frac{1}{m}$

$a > m$

Thus, II is true.

y-intercept of $L_2 < 0$

$\frac{1}{n} < 0$

$n < 0$

Thus, III is true.

27. A

$$2x^2 + 2y^2 + hx + 99y + 3 = 0$$

$$x^2 + y^2 + \frac{h}{2}x + \frac{99}{2}y + \frac{3}{2} = 0$$

$$\text{Centre} = (-\frac{h}{4}, -\frac{99}{4})$$

$$\frac{-\frac{99}{4} - 7}{-\frac{h}{4} - 3} = \frac{-5-7}{2-3}$$

$$\frac{99}{4} + 7 = 12(\frac{h}{4} + 3)$$

$$\frac{99}{4} + 7 = 3h + 36$$

$$h = -\frac{17}{12}$$

28. C

Expected gain

$$= \frac{3}{4} \times \$2 + \frac{1}{4} \times \$10$$

$$= \$4$$

29. C

Since the mode is 5, then $x = 5$.

$$\text{Mean} = \frac{1+3+4+4+5+5+5+8+10}{9} = 5$$

Thus, the removed datum is 5.

$$\text{New median} = \frac{4+5}{2} = 4.5$$

30. B

$$p = \frac{4\times 2+5\times 5+7\times 2+8+10\times 2+11+12+m}{15} = \frac{98+m}{15}$$

$q = m$

$r = 5$

So, $p = 6\frac{8}{15} + \frac{m}{15} > r$ and $5 \le q \le 7 \Rightarrow r \le q \le 7$

Thus, III is false and II is true.

For I, if $p < q$,

$$\frac{98+m}{15} > m$$

$$98 + m > 15m$$

$$m < 7$$

Thus, I is false.

31. B

$11\times 2^{32} + 12\times 2^{30} + 2^7 - 5\times 2^4$

$= 11\times 16^8 + 12\times 4\times 16^7 + 3\times 16$

$= 11\times 16^8 + 3\times 16^8 + 3\times 16$

$= 14\times 16^8 + 3\times 16$

$= \text{E00000030}_{16}$

32. B

Let $y = \text{g}(x)$ be the other graph.

Since the directions of opening of the graphs of $y = \text{f}(x)$ and $y = \text{g}(x)$ are different.

Therefore, $\text{g}(x) = -\text{f}(x)$.

In addition, the x-intercepts of the graph are $\frac{1}{3}$ time the other one.

So, $\text{g}(x) = -\text{f}(3x)$

33. A

$\frac{50}{4-3i}-ki$

$=\frac{50}{4-3i}\times\frac{4+3i}{4+3i}-ki$

$=8+6i-ki$

$=8+6i-ai^2$, where $k=ai$

$=8+a+6i$

So, the imaginary part is 6.

34. D

$T(n) = 313n - 3n^2 - [313(n-1) - 3(n-1)^2]$

$= 313n - 3n^2 - (313n - 313 - 3n^2 + 6n - 3)$

$= 313n - 3n^2 - 313n + 313 + 3n^2 - 6n + 3$

$= 316 - 6n$

So, it is an arithmetic sequence.

Thus, I is true.

$T(n) > 0$

$316 - 6n > 0$

$n < 52.67$

$n = 52$

So, the smallest positive term is the 52nd term.

Thus, II is false.

Sum of all positive terms

$= 313(52) - 3(52)^2$

$= 8164$

Thus, III is true.

35. D

From the graph, I and II is true.

$P(0, k)$

$Q(\log_a k, k)$

$R(\log_b k, k)$

$$\frac{QR}{PQ} = \frac{\log_b k - \log_a k}{\log_a k}$$

$$= \frac{\log_b k}{\log_a k} - 1$$

$$= \log_b a - 1$$

Thus, III is true.

36. D

$$\log_2 y - 2 = \frac{2-0}{0+4}(\log_4 x - 0)$$

$$\log_2 y = \frac{1}{2}\log_4 x + 2$$

$$\log_2 y = \log_4 16x^{\frac{1}{2}}$$

$$\log_2 y = \frac{\log_2 16x^{\frac{1}{2}}}{2}$$

$$y^2 = 16x^{\frac{1}{2}}$$

$$y^4 = 256x$$

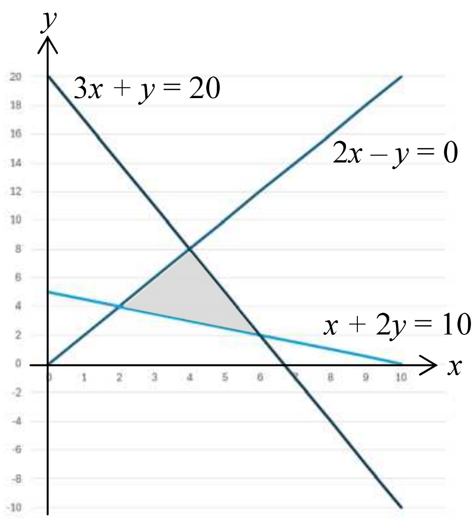
37. B

The ordered pair of (x, y) are (4, 8), (2, 4) and (6, 2)

Since the maximum value of $x - 3y + k$ attains at (6, 2),

$6 - 3(2) + k = 21$

$k = 21$



38. C

Join BE.

$\angle PAB = \angle BEA = \theta$ ($\angle$ in alt. segment)

$\angle ACE = \angle ABE$ ($\angle$s in the same segment)

$= 180^\circ - \theta - \phi$ ($\angle$ sum of Δ)

39. C

Let $Q(0, q)$

In-centre = (4, 4)

$q^2 + 12^2 = [(q-4)+8]^2$

$q^2 + 12^2 = (q+4)^2$

$q^2 + 144 = q^2 + 8q + 16$

$q = 16$

40. D

Let N be the mid-point of CH.

$MN = BC = 21$ cm

$EN = \sqrt{12^2 + 16^2} = 20\,\text{cm}$

$EM = \sqrt{20^2 + 21^2} = 29\,\text{cm}$

$\cos\theta = \frac{EN}{EM} = \frac{20}{29}$

41. B

$g(x) = f(-x-2) = -f(x)$

Thus, I and III is unknown.

II is true.

42. C.

Number of ways

$= C_2^8 \times C_2^6 \times C_2^4$

$= 2520$

43. D

The required probability $= \frac{4}{52} + \frac{40}{52} \times \frac{40}{52} \times \frac{4}{52} + ... = \frac{\frac{4}{52}}{1 - \left(\frac{40}{52}\right)^2} = \frac{13}{69}$

44. D

$x_1 = T(13)$, $x_2 = T(38)$

Since the common difference is unknown, $x_1 > x_2$ or $x_1 < x_2$.

Thus, I may not be true.

{T(26), T(27), T(28), …, T(50)}

= {T(1) + 25d, T(2) + 25d, T(3) + 25d, …, T(25) + 25d}, where d is the common difference.

So, the inter-quartile range and the standard deviation remain unchanged.

Thus, II and III are true.

45. A

Since the mean of 22 and 26 is also 24.

So, the mean will remain unchanged.

Thus, I is true.

$$\frac{(a_1 - 24)^2 + (a_2 - 24)^2 + ... + (a_{10} - 24)^2}{10} = 5.2$$

$$(a_1 - 24)^2 + (a_2 - 24)^2 + ... + (a_{10} - 24)^2 = 52$$

New variance

$$= \frac{(a_1 - 24)^2 + (a_2 - 24)^2 + ... + (a_{10} - 24)^2 + (22 - 24)^2 + (26 - 24)^2}{12}$$

$$= \frac{52 + 4 + 4}{12}$$

$$= 5$$

Thus, II is true.

$22 < 24.5 < 26$

So, the median will remain unchanged.

Thus, III is false.