F.6 Mathematics 2026 Mock Exam Paper I & II

Marking Scheme

This document was prepared for markers' reference. It should not be regarded as a set of model answers. Candidates and teachers who were not involved in the marking process are advised to interpret its contents with care.

General Marking Instructions

1. It is very important that all markers should adhere as closely as possible to the marking scheme. In many cases, however, candidates will have obtained a correct answer by an alternative method not specified in the marking scheme. In general, a correct answer merits ***all the marks*** allocated to that part, unless a particular method has been specified in the question. Markers should be patient in marking alternative solutions not specified in the marking scheme.

2. In the marking scheme, marks are classified into the following three categories:

'M' marks	awarded for correct methods being used;
'A' marks	awarded for the accuracy of the answers;
Marks without 'M' or 'A'	awarded for correctly completing a proof or arriving at an answer given in a question.

   In a question consisting of several parts each depending on the previous parts, 'M' marks should be awarded to steps or methods correctly deduced from previous answers, even if these answers are erroneous. However, 'A' marks for the corresponding answers should NOT be awarded (unless otherwise specified).

3. For the convenience of markers, the marking scheme was written as detailed as possible. However, it is still likely that candidates would not present their solution in the same explicit manner, e.g. some steps would either be omitted or stated implicitly. In such cases, markers should exercise their discretion in marking candidates' work. In general, marks for a certain step should be awarded if candidates' solution indicated that the relevant concept/technique had been used.

4. In marking candidates' work, the benefit of doubt should be given in the candidates' favour.

5. In the marking scheme, 'r.t.' stands for 'accepting answers which can be rounded off to' and 'f.t.' stands for 'follow through'. Steps which can be skipped are shaded whereas alternative answers are enclosed with rectangles. All fractional answers must be simplified.

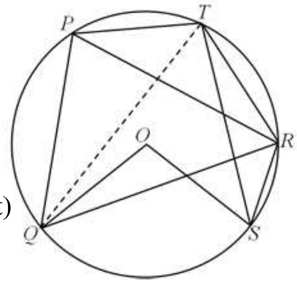
F.6 Mathematics 2026 Mock Exam Paper I & II

Paper 1

Solution	Marks	Remarks
1. $\dfrac{r^{-3}s}{(r^9s^3)^{-8}}$		
$=\dfrac{r^{-3}s}{r^{-72}s^{-24}}$	1M	for $(a^h)^k=a^{hk}$ or $(ab)^l=a^lb^l$
$=r^{-3-(-72)}s^{1-(-24)}$	1M	for $\dfrac{c^p}{c^q}=c^{p-q}$ or $d^{-r}=\dfrac{1}{d^r}$
$=r^{69}s^{25}$	1A	
	--------(3)	
2. (a) 153	1A	
(b) 152.3	1A	
(c) 200	1A	
	--------(3)	
3. $\dfrac{3}{8x+9}-\dfrac{2}{8x-6}$		
$=\dfrac{3(8x-6)-2(8x+9)}{(8x+9)(8x-6)}$	1M	
$=\dfrac{24x-18-16x-18}{(8x+9)(8x-6)}$	1M	
$=\dfrac{4x-18}{(8x+9)(4x-3)}$	1A	or equivalent
	--------(3)	
4. Let $4k$ and $7k$ be the original number of male passengers and female passengers respectively, where k is a positive constant.		
$\dfrac{4k-8}{7k-12}=\dfrac{5}{9}$	1M+1A	1M for fraction
$36k-72=35k-60$		
$k=12$	1M	
Thus, the original number of male passengers is 48.	1A	
	--------(4)	

Solution	Marks	Remarks
5. (a) $9m^2-49$		
$=(3m+7)(3m-7)$	1A	or equivalent
(b) $6m^2n+17mn+7n$		
$=n(2m+1)(3m+7)$	1A	or equivalent
(c) $27m^2-147+12m^2n+34mn+14n$		
$=3(9m^2-49)+2(6m^2n+17mn+7n)$		
$=3(3m+7)(3m-7)+2n(2m+1)(3m+7)$	1M	for using the result of (a) and (b)
$=(3m+7)(9m+2n+4mn-21)$	1A	or equivalent
	--------(4)	
6. (a) The coordinates of *B* are (–5, –3).	1A	
(b) The coordinates of *C* are (–3, –5).	1M	
The slope of *OB*		
$=\frac{-3-0}{-5-0}$	1M	either one
$=\frac{3}{5}$		
The slope of *OC*		
$=\frac{-5-0}{-3-0}$		
$=\frac{5}{3}$		
Since the slope of *OB* is not equal to the slope of *OC*.	1	
Thus, *O*, *B* and *C* are not collinear.		
	--------(4)	

Solution	Marks	Remarks
7. (a) $\dfrac{3(x-2)}{2} \le 20+5x$		
$3x-6 \le 40+10x$		
$3x-10x \le 40+6$	1M	for putting x on one side
$-7x \le 46$		
$x \ge -\dfrac{46}{7}$	1A	
$36+8x > 0$		
$8x > -36$		
$x > -\dfrac{9}{2}$		
Thus, the required range is $x \ge -\dfrac{46}{7}$.	1A	
(b) –6	1A	
	--------(4)	
8. Let $\$x$ be the marked price of the jacket.		
The cost of the jacket		
$=\dfrac{x}{1+30\%}$	1M	
$=\$\left(\dfrac{10x}{13}\right)$		
The selling price of the jacket		
$= (1-25\%)x$	1M	
$=\$\left(\dfrac{3x}{4}\right)$		
$\dfrac{10x}{13}-\dfrac{3x}{4}=17$	1M+1A	1M for cost – selling price
$\dfrac{x}{52}=17$		
$x=884$	1A	
Thus, the marked price of the jacket is \$884.		
	--------(5)	

Solution	Marks	Remarks
9. Join TQ.		
		
$\because$ TS bisects $\angle OSR$.		
$\therefore$ $\angle TSR = \dfrac{1}{2}\angle OSR = 37°$		
$\angle TQR = \angle TSR$ ($\angle$s in the same segment)	1M	
$= 37°$		
$\because$ $PT = TR$ (given)		
$\therefore$ $\angle TQP = \angle TQR$ (equal chords, equal $\angle$s)	1M	
$= 37°$		
In ΔPQR,		
$\angle RQP + \angle QPR + \angle QRP = 180°$ ($\angle$ sum of Δ)		
$(\angle TQP + \angle TQR) + \angle QPR + \angle QRP = 180°$		
$(37° + 37°) + 79° + \angle QRP = 180°$		
$\angle QRP = 27°$	1M	
$\overset{\frown}{PT} : \overset{\frown}{PQ} = \angle TQP : \angle QRP$ (arcs prop. to $\angle$s at Θ^{ce})	1M	
$\overset{\frown}{PT} : 10\text{ cm} = 37° : 27°$		
$\overset{\frown}{PT} = 10 \times \dfrac{37}{27}\text{ cm} \approx 13.7037\text{ cm} < 14\text{ cm}$	1A	
Thus, $\overset{\frown}{PT}$ does not exceed 14 cm.		
	--------(5)	

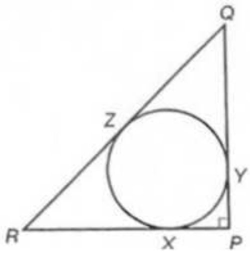
Solution	Marks	Remarks
10. (a) Let $g(x) = (x^2 - 2x - 15)(ax + b) + 10x + k$, where a and b are constants.		
$\because$ When $g(x)$ is divided by $x - 5$, the remainder is 80.		
$\therefore$ $g(5) = 80$		
$[(5)^2 - 2(5) - 15][a(5) + b] + 10(5) + k = 80$	1M	
$50 + k = 80$		
$k = 30$	1A	
	--------(2)	
(b) $\because$ $g(x)$ is divisible by $x - 4$.		
$\therefore$ $g(4) = 0$		
$[(4)^2 - 2(4) - 15][a(4) + b] + 10(4) + 30 = 0$		
$-7(4a + b) + 70 = 0$		
$4a + b = 10$ ……(1)	1M	either one
$\because$ When $g(x)$ is divided by $x + 2$, the remainder is 66.		
$\therefore$ $g(-2) = 66$		
$[(-2)^2 - 2(-2) - 15][a(-2) + b] + 10(-2) + 30 = 66$		
$-7(-2a + b) + 10 = 66$		
$-2a + b = -8$ ……(2)		
By solving (1) and (2), we have $a = 3$, $b = -2$.	1A	
$\therefore$ $g(x)$		
$= (x^2 - 2x - 15)(3x - 2) + 10x + 30$		
$= (3x^3 - 2x^2 - 6x^2 + 4x - 45x + 30 + 10x + 30$		
$= 3x^3 - 8x^2 - 31x + 60$		
$= (x - 4)(3x^2 + 4x - 15)$		
$= (x - 4)(x + 3)(3x - 5)$	1M	
$\therefore$ The roots of $g(x) = 0$ are 4, – 3 and $\frac{5}{3}$.		
$\therefore$ Thus, the equation $g(x) = 0$ has two integral roots.	1A	f.t.
	--------(4)	

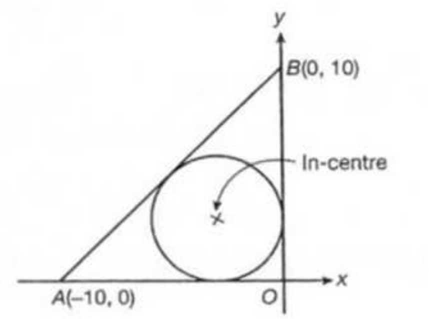
Solution	Marks	Remarks
11. (a) Let $f(x) = ax^2 + b(x + 3)$, where a and b are non-zero constants.	1M	
So, we have $25a + 8b = -22$ and $64a + 11b = 29$.	1M	for either substitution
Solving, we have $a = 2$ and $b = -9$.		
Hence, we have $f(x) = 2x^2 - 9x - 27$.	1A	
	--------(3)	
(b) $f(x) + k = 0$		
$2x^2 - 9x - 27 + k = 0$	1M	
Note that the equation $f(x) + k = 0$ has real roots.		
$(-9)^2 - 4(2)(-27 + k) \geq 0$	1M	
$297 - 8k \geq 0$		
$k \leq \frac{297}{8}$	1A	or 37.125
	--------(3)	
12. (a) $\frac{34+(30+a)}{2} = 34$		
$a = 4$	1A	
$\frac{41+(40+b)}{2} - \frac{24+26}{2} = 16$		
$b = 1$	1A	
$(40+c) - 12 = 37$		
$c = 9$	1A	
	--------(3)	
(b) (i) The range after the programme $= 40 - 10$ $= 30$ minutes	1M	
The range of the distribution of the completion time after the programme is less than that before the programme. Thus, the completion time is not more dispersed after the programme.	1A	
(ii) Note that the maximum of the distribution of the completion time after the programme is 40 minutes which is less than the upper quartile of the distribution of the completion time before the programme.	1M	
Thus, the claim is agreed.	1A	
	--------(4)	

Solution	Marks	Remarks
13. (a) Let V_A and V_B be the volumes of the smaller circular cone and the original circular cone respectively.		
Since the two cones are similar right circular cones,		
$\frac{V_A}{V_B}=\left(\frac{12-3}{12}\right)^3$	1M	
$\frac{V_A}{V_B}=\frac{27}{64}$	1A	
	--------(2)	
(b) (i) The volume of the frustum		
$=\frac{1}{3}\pi(18)^2(9)\times\frac{64-27}{27}$	1M+1M	
$=1332\pi\text{ cm}^3$	1A	
Let x cm be the radius of the original circular cone.		
Therefore, we have $\frac{18}{x}=\frac{12-3}{12}$.		
Solving, we have $x = 24$.	1M	
The volume of the frustum		
$=\frac{1}{3}\pi(24)^2(12)-\frac{1}{3}\pi(18)^2(9)$	1M	
$= 1332\pi\text{ cm}^3$	1A	
(ii) The volume of the hemisphere $=\frac{2}{3}\pi(24)^3 = 9216\pi\text{ cm}^3$	1M	
The volume of the remaining water in the frustum		
$= (10000\pi - 9216\pi)\text{ cm}^3$		
$= 784\pi\text{ cm}^3$		
Let d cm be the depth of water in the frustum.		
$\frac{(12-h)^3}{12^3}=\frac{2304\pi-784\pi}{2304\pi}$		
$h=1.5535607632$	1A	
$\therefore$ The depth of the water		
$\approx (24 + 1.5535607632)$		
≈ 25.6 cm	1A	r.t. 25.6 cm
	--------(6)	

Solution	Marks	Remarks
14. (a) (i) Γ is parallel to L_2.	1A	
(ii) Let c = y-intercept of L_1,		
$\frac{c-(-20)}{0-(-4)}=\frac{-35-(-20)}{16-(-4)}$		
$\frac{c+20}{4}=\frac{-15}{20}$		
$c=-23$	1M	
Note that the y-intercept of L_2 is 2.		
So the y-intercept of Γ $=\frac{-23+2}{2}=\frac{-21}{2}$	1M	
Thus, the required equation is $y=-\frac{3}{4}x-\frac{21}{2}$.	1A --------(4)	(or $3x+4y+42=0$)
(b) Let $M=(m, 0)$ and $N=(0, n)$.		
Mid-point of $MN=(\frac{m}{2},\frac{n}{2})$.		
$\frac{n}{2}=-\frac{3}{4}(\frac{m}{2})-\frac{21}{2}$		
$3m+4n=-84\cdots\cdots(1)$	1M	
$\frac{n-0}{0-m}\cdot\frac{-3}{4}=-1$		
$4m+3n=0\cdots\cdots(2)$	1M	
By solving (1) and (2), we have m = 36 and n = –48.	1A	for both correct
Thus, the required equation is		
$\frac{x}{36}+\frac{y}{-48}=1$		
$y=\frac{4}{3}x-48$	1A --------(4)	(or $4x-3y-144=0$)

Solution	Marks	Remarks
15. (a) The required number of queues		
$= 10!$		
$= 3628800$	1A	
	--------(1)	
(b) The required probability		
$= \dfrac{P_2^4 \times P_6^6 \times P_2^5}{P_2^4 \times P_8^8}$	1M+1M	1M for denominator 1Mfor numerator
$= \dfrac{5}{14}$	1A	r.t. 0.357
	-------(3)	
16 (a) $\begin{cases} 2\beta = 9 - 3\alpha & \text{......(1)} \\ 8\beta = 4\alpha^2 - 24\alpha + 45 & \text{......(2)} \end{cases}$		
$4(9 - 3\alpha) = 4\alpha^2 - 24\alpha + 45$	1M	
By solving (1) and (2), we have $\alpha = \dfrac{3}{2}$, $\beta = \dfrac{9}{4}$.	1A	for both correct
	-------(2)	
(b) $\alpha^{k+1} + \beta^{k+2} > 7 \times 10^{20}$		
$\left(\dfrac{3}{2}\right)^{k+1} + \left(\dfrac{9}{4}\right)^{k+2} > 7 \times 10^{20}$		
$\dfrac{81}{16}\left(\dfrac{3}{2}\right)^{2k} + \dfrac{3}{2}\left(\dfrac{3}{2}\right)^{k} - 7 \times 10^{20} > 0$	1M	
$\left(\dfrac{3}{2}\right)^{k} > 1.175889472 \times 10^{10}$ or $\left(\dfrac{3}{2}\right)^{k} < -1.175889472 \times 10^{10}$ (rejected)		
$k > \dfrac{\log 1.175889472 \times 10^{10}}{\log \dfrac{3}{2}}$		
$k > 57.18833834$	1A	
$\therefore$ The least integral value of k is 58.	1A	
	-------(3)	

Solution	Marks	Remarks
17. (a) Let r be the radius of the inscribed circle XYZ of ΔPQR.		
Consider the figure,		
$QZ = QY = 10 - r$, $RZ = RX = 10 - r$ 	1M	
$QR^2 = PQ^2 + PR^2$		
$QR = \sqrt{10^2 + 10^2} = 10\sqrt{2}$	1M	
$10 - r + 10 - r = 10\sqrt{2}$	1M	
$20 - 2r = 10\sqrt{2}$		
$r = 10 - 5\sqrt{2}$	1A	
	-------(4)	
Let r be the radius of the inscribed circle XYZ of ΔPQR.		
Let a and p be the area and the perimeter XYZ respectively.		
$QR = \sqrt{10^2 + 10^2} = 10\sqrt{2}$		
$2a = pr$	1M	
$2 \times \frac{10 \times 10}{2} = (10 + 10 + 10\sqrt{2})r$	1M+1M	1M for area 1M for perimeter
$r = \frac{10}{2 + \sqrt{2}} = 10 - 5\sqrt{2}$	1A	
	-------(4)	

Solution	Marks	Remarks
17. (b) From (a),		
radius of the inscribed circle of $\Delta OAB = 10 - 5\sqrt{2}$		
Consider the figure,		
		
Coordinates of the in-centre of ΔOAB		
$= (5\sqrt{2} - 10, 10 - 5\sqrt{2})$	1A	
Substituting the coordinates of the in-centre into the equation of the line,		
L.H.S. $= 2(5\sqrt{2} - 10) - \sqrt{2}(10 - 5\sqrt{2}) + 10$	1M	
$= 0$		
$=$ R.H.S.		
$\therefore$ The line passes through the in-centre of ΔOAB.		
$\therefore$ The claim is agreed.	1A	f.t.
	--------(3)	
18. (a) $AD = (CD \cos \angle ADC)$ cm		
$= [12 \cos (180^\circ - 120^\circ)]$ cm		
$= 6$ cm		
$BD = (11 - 6)$ cm $= 5$ cm		
Let x cm be the distance between B and F.		
Since, $\Delta FBE \sim \Delta FDA$		
$\frac{BF}{DF} = \frac{BE}{AD}$	1M	
$\frac{x}{x+5} = \frac{4}{6}$		
$x = 10$		
$\therefore$ The distance between B and F is 10 cm.	1A	
	--------(2)	

Solution	Marks	Remarks
18. (b) The area of ΔDCF		
$= \frac{1}{2}(DF)(CD)\sin\angle BDC$		
$= [\frac{1}{2}(10+5)(12)\sin 120°]\ \text{cm}^2$	1M	
$= 45\sqrt{3}\ \text{cm}^2$		
$= 77.94228634\ \text{cm}^2$		
≈ 77.9 cm	1A	r.t. 77.9 cm
	--------(2)	
(c) In ΔCDF, by cosine formula,		
$CF^2 = DF^2 + CD^2 - 2(DF)(CD)\cos\angle BDC$	1M	
$CF^2 = 15^2 + 12^2 - 2(15)(12)\cos 120°$		
$CF = 23.43074903$ cm		
Let h cm be the perpendicular distance from D to CF.		
$\frac{1}{2}(CF)h = 45\sqrt{3}$		
$h = 6.652991439$	1M	
The required angle		
$= \sin^{-1}\frac{6}{6.652991439}$		
$= 64.40231059°$		
$\approx 64.4°$		
Thus, the inclination of the plane BCD to the horizontal ground is 64.4°.	1A	r.t. 64.4°
	--------(3)	

Solution	Marks	Remarks
19. (a) f(x)		
$= 2x^2 - 16kx - 8x + 32k^2 + 31k + 18$		
$= 2(x^2 - 8kx - 4x) + 32k^2 + 31k + 18$		
$= 2[x^2 - 2(4k + 2)x + (4k + 2)^2 - (4k + 2)^2] + 32k^2 + 31k + 18$	1M	
$= 2[x - (4k + 2)]^2 - 2(16k^2 + 16k + 4) + 32k^2 + 31k + 18$		
$= 2(x - 4k - 2)^2 - 32k^2 - 32k - 8 + 32k^2 + 31k + 18$		
$= 2(x - 4k - 2)^2 - k + 10$		
Thus, the coordinates of Q are $(4k + 2, -k + 10)$.	1A	
	--------(2)	
(b) f($2x - 22$) − 14		
$= 2(2x - 22 - 4k - 2)^2 - k + 10 - 14$		
$= 2[2(x - 2k - 12)]^2 - k - 4$		
$= 8(x - 2k - 12)^2 - k - 4$		
Thus, the coordinates of R are $(2k + 12, -k - 4)$.	1A	
	--------(1)	
(c) (i) Coordinates of the mid-point of QS		
$= \left(\dfrac{4k+2+4k-2}{2}, \dfrac{-k+10-k-4}{2}\right)$		
$= (4k, -k + 3)$		
Slope of QS		
$= \dfrac{-k+10+k+4}{4k+2-4k+2}$		
$= \dfrac{7}{2}$		
Slope of the perpendicular bisector of $QS = -\dfrac{2}{7}$		
$\therefore$ The required equation is		
$y + k - 3 = -\dfrac{2}{7}(x - 4k)$	1M	
$y = -\dfrac{2}{7}x + \dfrac{k+21}{7}$	1A	or $2x + 7y - k - 21 = 0$

Solution	Marks	Remarks
19. (c) (ii) Since, y-coordinate of R equals to the y-coordinate of S		
$\therefore$ RS is a horizontal line.		
$\therefore$ x-coordinate of G = x-coordinate of mid-point of RS		
$= \dfrac{2k+12+4k-2}{2}$	1M	
$= 3k+5$		
Substitute $x = 3k + 5$ into the equation obtained in (c)(i).		
$y = -\dfrac{2}{7}(3k+5) + \dfrac{k+21}{7}$	1M	
$y = \dfrac{11-5k}{7}$		
$\therefore$ The coordinate of G are $(3k + 5, \dfrac{11-5k}{7})$.	1A	
(iii) If $AQGS$ is a square, the $GQ \perp GS$.		
Slope of $GQ = \dfrac{\frac{11-5k}{7}+k-10}{3k+5-4k-2} = \dfrac{2k-59}{7(3-k)}$		
Slope of $GS = \dfrac{\frac{11-5k}{7}+k+4}{3k+5-4k+2} = \dfrac{2k+39}{7(7-k)}$		
Slope of GQ × Slope of $GS = -1$	1M	
$\dfrac{2k-59}{7(3-k)} \times \dfrac{2k+39}{7(7-k)} = -1$		
$53k^2 - 530k - 1272 = 0$		
$k = 12$ or $k = -2$ (rejected)	1A	
$\therefore$ When $k = 12$, we have $GQ \perp GS$.		
Note that $\angle AQG = \angle ASG = 90^\circ$.		
When $k = 12$,		
$\angle QAS = 360^\circ - 90^\circ - 90^\circ - 90^\circ = 90^\circ$	1M	
And $QG = GS$ (or $AQ = AS$)		
$\therefore$ When $k = 12$, $AQGS$ is a square.		
$\therefore$ Thus, it is possible that $AQGS$ is a square.	1A	
	--------(9)	