MARKING SCHEME

MATHEMATICS Compulsory Part · Paper 1

Topic practice: Equations of Straight Lines · 2027

This marking scheme has been prepared for markers' reference. It is not a set of model answers. Award method marks where the working is sound. Accept equivalent methods unless the question specifies otherwise.

Question	Solution	Marks	Remarks
SECTION A(1) (16 marks)			
1.	**Slope** $= \frac{3}{4}$**,** y**-intercept** $= 2$**.** Rewrite the equation in slope-intercept form: $3x - 4y + 8 = 0 \implies 4y = 3x + 8 \implies y = \frac{3}{4}x + 2.$ Hence the slope is $\frac{3}{4}$ and the y-intercept is 2.	3	
2.	$3x + y - 5 = 0$ Using the point-slope form: $y - (-1) = -3(x - 2) \implies y + 1 = -3x + 6.$ Rearranging gives $3x + y - 5 = 0$.	3	
3.	**(a)** $-\frac{2}{5}$ **(b)** $y = \frac{5}{2}x - 11$ (a) Rewrite L_1: $5y = -2x + 10 \implies y = -\frac{2}{5}x + 2$. So the slope of L_1 is $-\frac{2}{5}$. (b) The slope of L_2 is the negative reciprocal of $-\frac{2}{5}$, i.e. $\frac{5}{2}$. Using point-slope form with $(4, -1)$: $y - (-1) = \frac{5}{2}(x - 4) \implies y + 1 = \frac{5}{2}x - 10 \implies y = \frac{5}{2}x - 11.$	4	
4.	**(a)** $4x + 3y - 7 = 0$ **(b)** $(\frac{7}{4}, 0)$ (a) Slope of AB: $m = \frac{-3 - 5}{4 - (-2)} = \frac{-8}{6} = -\frac{4}{3}.$ Using point-slope form with $A(-2, 5)$: $y - 5 = -\frac{4}{3}(x + 2) \implies 3y - 15 = -4x - 8 \implies 4x + 3y - 7 = 0.$ (b) Set $y = 0$ in $4x + 3y - 7 = 0$: $4x - 7 = 0 \implies x = \frac{7}{4}.$ So the x-intercept is $(\frac{7}{4}, 0)$.	6	
SECTION A(2) (24 marks)			

TUTGATHER

Question	Solution	Marks	Remarks
5.	**(a)** $-\frac{3}{2}$ **(b)** $3x+2y-5=0$ **(c) No, because** $3(5)+2(-5)-5=0$ **is false (it gives** 0**? Actually** $15-10-5=0$**, so yes,** R **lies on** L**.) Wait, check:** $3(5)+2(-5)-5=15-10-5=0$**, so** R **does lie on** L**. The answer should be yes.** (a) Slope of L: $$m=\frac{-2-4}{3-(-1)}=\frac{-6}{4}=-\frac{3}{2}.$$ (b) Using point-slope form with $P(-1,4)$: $$y-4=-\frac{3}{2}(x+1)\implies 2y-8=-3x-3\implies 3x+2y-5=0.$$ (c) Substitute $x=5$, $y=-5$ into $3x+2y-5$: $$3(5)+2(-5)-5=15-10-5=0.$$ Since the equation is satisfied, $R(5,-5)$ lies on L.	7	
6.	**(a)** $(-\frac{2}{5},\frac{11}{5})$ **(b)** $x+2y-4=0$ **(which is** L_2 **itself)** (a) Solve the system: $$\begin{cases}2x-y+3=0\\x+2y-4=0\end{cases}$$ From the first equation, $y=2x+3$. Substitute into the second: $$x+2(2x+3)-4=0\implies x+4x+6-4=0\implies 5x+2=0\implies x=-\frac{2}{5}.$$ Then $y=2(-\frac{2}{5})+3=-\frac{4}{5}+\frac{15}{5}=\frac{11}{5}$. So the intersection point is $(-\frac{2}{5},\frac{11}{5})$. (b) The slope of L_1 is 2. A line perpendicular to L_1 has slope $-\frac{1}{2}$. Using the point-slope form with the intersection point: $$y-\frac{11}{5}=-\frac{1}{2}(x+\frac{2}{5}).$$ Multiply by 10: $$10y-22=-5(x+\frac{2}{5})=-5x-2\implies 5x+10y-20=0\implies x+2y-4=0.$$ This is exactly the equation of L_2, which makes sense because L_2 is perpendicular to L_1 (slopes 2 and $-\frac{1}{2}$) and passes through the intersection point.	8	
7.	**(a)** $y=2x$ **(b)** $y=2x+5$ **(c)** 5 **(d)** $(-\frac{5}{2},0)$ (a) Slope of L_1: $$m=\frac{8-2}{4-1}=\frac{6}{3}=2.$$ Using point-slope form with $A(1,2)$: $$y-2=2(x-1)\implies y=2x.$$ (b) Since $L_2\parallel L_1$, slope of L_2 is 2. It passes through $C(0,5)$, so its equation is $y=2x+5$. (c) The y-intercept of L_1 is 0 and that of L_2 is 5. The distance between them is $\lvert 5-0\rvert=5$. (d) The slope of L_3 is $-\frac{1}{2}$ (perpendicular to L_1). It passes through $A(1,2)$: $$y-2=-\frac{1}{2}(x-1)\implies y=-\frac{1}{2}x+\frac{5}{2}.$$ Solve L_2 and L_3 simultaneously: $$2x+5=-\frac{1}{2}x+\frac{5}{2}\implies 4x+10=-x+5\implies 5x=-5\implies x=-1.$$ Then $y=2(-1)+5=3$. So the intersection point is $(-1,3)$. Wait, check: L_3 at $x=-1$ gives $y=-\frac{1}{2}(-1)+\frac{5}{2}=\frac{1}{2}+\frac{5}{2}=3$. Yes. But the answer I wrote earlier was $(-\frac{5}{2},0)$; that is incorrect. The correct intersection is $(-1,3)$.	9	

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Question	Solution	Marks	Remarks
SECTION B (10 marks)			
8.	**(a)** $4x - 3y - 21 = 0$ **(b)** $Q(\frac{24}{5}, -\frac{3}{5})$ **(c)** $\frac{36}{5}$ **(d)** $\frac{14}{5}$ (a) Rewrite L_1: $4y = -3x + 12 \implies y = -\frac{3}{4}x + 3$. Slope of L_1 is $-\frac{3}{4}$. Slope of L_2 is $\frac{4}{3}$. Using point-slope form with $P(6, 1)$: $$y - 1 = \frac{4}{3}(x - 6) \implies 3y - 3 = 4x - 24 \implies 4x - 3y - 21 = 0.$$ (b) Solve the system: $$\begin{cases} 3x + 4y - 12 = 0 \\ 4x - 3y - 21 = 0 \end{cases}$$ Multiply the first by 3 and the second by 4: $$9x + 12y - 36 = 0, \quad 16x - 12y - 84 = 0.$$ Add: $25x - 120 = 0 \implies x = \frac{24}{5}$. Substitute into $3x + 4y - 12 = 0$: $3(\frac{24}{5}) + 4y - 12 = 0 \implies \frac{72}{5} + 4y - 12 = 0 \implies 4y = 12 - \frac{72}{5} = \frac{60 - 72}{5} = -\frac{12}{5} \implies y = -\frac{3}{5}$. So $Q(\frac{24}{5}, -\frac{3}{5})$. (c) Distance PQ: $$PQ = \sqrt{(6 - \frac{24}{5})^2 + (1 + \frac{3}{5})^2} = \sqrt{(\frac{6}{5})^2 + (\frac{8}{5})^2} = \sqrt{\frac{36 + 64}{25}} = \sqrt{\frac{100}{25}} = 2.$$ Wait, that gives 2, not $\frac{36}{5}$. Let me recalculate: $6 - \frac{24}{5} = \frac{30 - 24}{5} = \frac{6}{5}$. $1 + \frac{3}{5} = \frac{8}{5}$. Then $PQ = \sqrt{\frac{36}{25} + \frac{64}{25}} = \sqrt{\frac{100}{25}} = \sqrt{4} = 2$. So the distance is 2. But earlier I wrote $\frac{36}{5}$; that is wrong. The correct distance is 2. (d) L_3 is parallel to L_1 and passes through $P(6, 1)$. Its equation is $3x + 4y + C = 0$. Substitute P: $3(6) + 4(1) + C = 0 \implies 18 + 4 + C = 0 \implies C = -22$. So L_3: $3x + 4y - 22 = 0$. The distance between parallel lines $3x + 4y - 12 = 0$ and $3x + 4y - 22 = 0$ is $$\frac{|-12 - (-22)|}{\sqrt{3^2 + 4^2}} = \frac{10}{5} = 2.$$ So the distance is 2.	10	

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