MODUL
PERKEMBANGAN PEMBELAJARAN
SPM 2020

SKEMA
MPP3

MATEMATIK TAMBAHAN

DISEDIAKAN OLEH PANEL AKRAM NEGERI TERENGGANU

MARK SCHEME FOR ADDITIONAL MATHS. – MPP3 (PPC)

PAPER 1

No	Mark Scheme		Σ Marks
1	Mode , highest demand	2	2
	Mode	B1	
2	(*a*) $k = 0$	1	3
	(*b*) $3 + k$	2	
	$\int_a^b f(x)\,dx + \int_b^c f(x)\,dx$,	B1	
3	16	2	2
	$\left({}^3C_2 \times {}^5C_1\right) + \left({}^3C_3 \times {}^5C_0\right)$	B1	
4	$y = x^3 - 3x^2 + 5x - 7$	3	3
	$y = \frac{3x^3}{3} - \frac{6x^2}{2} + 5x + c$	B2	
	$\frac{dy}{dx} = \frac{6x^2}{2} - 6x + c$	B1	
5	(*a*) 5040	1	3
	(*b*) 1440	2	
	$3 \times {}^5P_5 \times 4$ OR $3 \times 5 \times 4 \times 3 \times 2 \times 1 \times 4$	B1	

6	$\frac{dr}{dt}=-\frac{1}{20\pi}$	4	4
	$\frac{dr}{dt}=\frac{1}{8\pi\left(\frac{1}{2}\right)}\times(-0.2)$	B3	
	$\frac{dA}{dr}=8\pi\left(\frac{1}{2}\right)$	B2	
	$\frac{dA}{dr}=8\pi r$ or $r=\frac{1}{2}$	B1	
7	$\delta x=-\frac{p}{12}$	3	3
	$-p=\frac{3}{\left(-\frac{1}{2}\right)^2}\times\delta x$	B2	
	$\frac{dy}{dx}=\frac{3}{x^2}$ or $x=-\frac{1}{2}$ or $\delta y=-p$	B1	
8	(*a*) 17	1	3
	(*b*) 1 , $\frac{1}{2}$ (both)	2	
	$3x-2=x$ or $3x-2=-x$	B1	
9	(*a*) A (30, 40) dan C (60, 20)	1	4
	(*b*) 108.17	3	
	$\sqrt{(90)^2+(60)^2}$	B2	
	$\left(\frac{x}{2},\frac{y}{2}\right)=\left(\frac{90}{2},\frac{60}{2}\right)$ guna titik tengah OB = titik tengah AC	B1	

10	(*a*) $B(4, 0)$	1	3
	(*b*) $h = 2$	2	
	$\frac{1}{2}\left(\frac{8-h}{2}\right)(8) = 12$	B1	
11	(*a*) $12\underset{\sim}{x} - 4\underset{\sim}{y}$	2	4
	$\overrightarrow{SQ} = \overrightarrow{SP} + \overrightarrow{PQ}$	B1	
	(*b*) $3\underset{\sim}{x} + 3\underset{\sim}{y}$	2	
	$\overrightarrow{PT} = 4\underset{\sim}{y} + \frac{1}{4}(-4\underset{\sim}{y} + 12\underset{\sim}{x})$	B1	
12	(*a*) 7	2	4
	$g^{-1}(x) = x + 3$ OR $x - 3 = 4$	B1	
	(b) -40	2	
	$7(-6) + 2$	B1	
13	(*a*) $m = 13$	1	3
	(*b*) $\{-5, 13, 19, 25\}$	1	
	(*c*) $f(x) = 3x + 1$ or $f : x \to 3x + 1$	1	
14	(*a*) 10	1	3
	(*b*) 1.001	2	
	$10(0.75)^8$	B1	

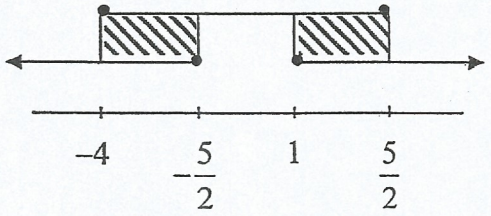
15	$x=\frac{729}{y^3}$	4	4
	$x^2y^6=3^{12}$	B3	
	$\log_3 x^2y^6=12$	B2	
	$\log_3 y^2=4-\frac{\log_3 x^2}{\log_3 27}$ (use law and change base of logarithm)	B1	
16	$p=-4$, 8 both	2	2
	$(p-2)^2-4(1)(9)=0$	B1	
17	(*a*) $P(1, 2)$ and $Q(3, 5)$	2	4
	$P(1 , \log_2 4)$ *or* $Q(3 , \log_2 32)$	B1	
	(*b*) $\log_2 y=\frac{3}{2}x+\frac{1}{2}$	2	
	$m=\frac{3}{2}$ **or** $c=\frac{1}{2}$ **OR** $\log y=\log a+x\log b$	B1	
18	(*a*) $h(t)=-2(t-1)^2+3$	2	4
	$h(t)=-2\left[t^2-2t+(-\frac{2}{2})^2-(-\frac{2}{2})^2-\frac{1}{2}\right]$	B1	
	OR		
	$h(t)=-2\left(t+\frac{4}{2(-2)}\right)^2+1-\frac{4^2}{4(-2)}$		
	(*b*) (i) Maximum height = 3	1	
	(ii) $0\le t<1$	1	

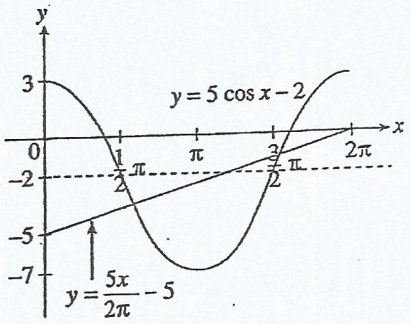
19	(*a*) 0.6109	1	3
	(*b*) 6.971	2	
	$2r + r(0.6109) = 18.2$	B1	
20	(*a*) $a = 2$	1	3
	(*b*) $b = 3$	1	
	(*c*) $c = -1$	1	
21	$a = 2$	2	2
	$\frac{10}{2}[a + 29] = 155$	B1	
22	$n = 25$, $p = \frac{1}{5}$ (both)	3	3
	$n = 25$ or $p = \frac{1}{5}$	B2	
	$2 = \sqrt{np(1-p)}$ or $np = 5$	B1	
23	875	4	4
	$3510 - \frac{31}{2}[2(10) + 30(5)]$ **OR** $\frac{5}{2}[2(165) + 4(5)]$	B3	
	$n = 36$	B2	
	$\frac{n}{2}[2(10) + (n-1)5] = 3510$	B1	

24	(*a*) $\frac{1}{15}$	1	4
	(*b*) $\frac{5}{12}$	3	
	$\left(\frac{2}{3}\right)\left(\frac{1}{4}\right)\left(\frac{4}{5}\right)+\left(\frac{1}{3}\right)\left(\frac{3}{4}\right)\left(\frac{4}{5}\right)+\left(\frac{1}{3}\right)\left(\frac{1}{4}\right)\left(\frac{1}{5}\right)+\frac{1}{15}$	B2	
	$\left(\frac{2}{3}\right)\left(\frac{1}{4}\right)\left(\frac{4}{5}\right)$ or $\left(\frac{1}{3}\right)\left(\frac{3}{4}\right)\left(\frac{4}{5}\right)$ or $\left(\frac{1}{3}\right)\left(\frac{1}{4}\right)\left(\frac{1}{5}\right)$	B1	
25.	(*a*) 0.685	1	3
	$\frac{1-0.37}{2}$	B1	
	(*b*) 0.482	1	

PERATURAN PEMARKAHAN ADDITIONAL MATHEMATICS
KERTAS 2

No.	PERATURAN PEMARKAHAN	Σ MARKAH
1	(*a*) $\frac{9+3+3+9+3+5+p+q}{8}=7.5$ **K1** $p+q=18$ **N1** (i) mod = 9 **N1** (ii) mod = 3 **N1** (*b*) $\frac{9^2+3^2+3^2+9^2+3^2+15^2+p^2+(18-p)^2}{8}-7.5^2=16$ or $\frac{9^2+3^2+3^2+9^2+3^2+15^2+(18-q)^2+q^2}{8}-7.5^2=16$ **K1** $p=10, p=8$ **N1**	6
2	$y=4-3x$ OR $x=\frac{4-y}{3}$ P1 $\frac{2}{4-3x}+\frac{3}{x}=6$ or $2x+3(4-3x)=6x(4-3x)$ OR $\frac{2}{y}+\frac{3}{\left(\frac{4-y}{3}\right)}=6$ K1 $18x^2-31x+12=0$ $6y^2-17y+8=0$ $\frac{-(-31)\pm\sqrt{(-31)^2-4(18)(12)}}{2(18)}$ $\frac{-(-17)\pm\sqrt{(-17)^2-4(6)(8)}}{2(6)}$ K1 $x=1.135$; $x=0.588$ $y=2.237$; $y=0.596$ N1 $y=0.595$; $y=2.236$ $x=0.588$; $x=1.135$ N1	5

No.	PERATURAN PEMARKAHAN		Σ MARKAH
3	(*a*) $3 \le (x+2)(2x-1) \le 18$	P1	7
	$(x-1)(2x+5) \ge 0$ or $(2x-5)(x+4) \le 0$	K1	
	$x \ge 1$, $x \le -\frac{5}{2}$ or $-4 \le x \le \frac{5}{2}$	N1	
		K1	
	Julat x : $1 \le x \le \frac{5}{2}$	N1	
	(*b*) (4.5)(2) + (4)(2) or 6(2.5) + 2	K1	
	= 17 m	N1	

No.	PERATURAN PEMARKAHAN	Σ MARKAH
4	(a) $\frac{\tan 2x \cos 2x}{\sin x} = \frac{\left(\frac{\sin 2x}{\cos 2x}\right)\cos 2x}{\sin x}$ dan $\frac{2\sin x \cos x}{\sin x}$ K1 $= 2kos\,x$ N1 (b) (i)  Shape of cosine graph P1 Amplitude = 5 P1 1 cycle for $0 \leq x \leq 2\pi$ and shifted down 2 units P1 (ii) $y = \frac{5x}{2\pi} - 5$ N1 Lakar garis lurus samada kecerunan atau pintasan-y betul K1 Bilangan penyelesaian = 2 N1	8

No.	PERATURAN PEMARKAHAN	Σ MARKAH
5	(*a*) $(-4\underline{i}-8\underline{j})+(\underline{i}+2\underline{j})$ or $(-3\underline{i}-6\underline{j})+(\underline{i}+2\underline{j})$ K1 Boat A = $-3\underline{i}-6\underline{j}$ N1 Boat B = $-2\underline{i}-4\underline{j}$ N1 difference between the speed of the two boats = 2.236 ms^{-1} N1 (*b*) (i) $3\underline{i}-\underline{j}$ N1 (ii) $\dfrac{3\underline{i}-\underline{j}}{\sqrt{(3)^2+(-1)^2}}$ K1 guna rumus vekor unit $\dfrac{3\underline{i}-\underline{j}}{\sqrt{10}}$ N1	7

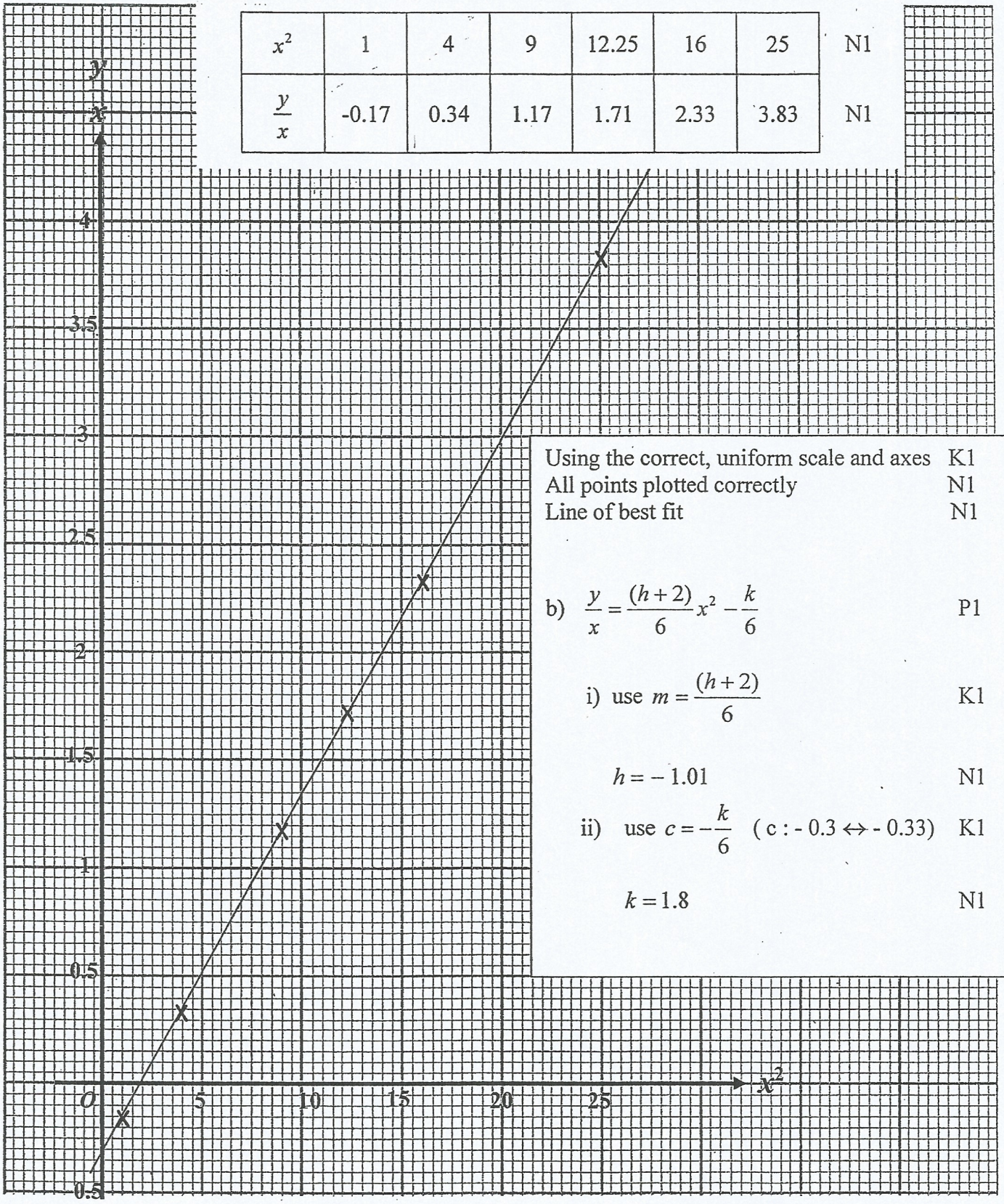
No.	PERATURAN PEMARKAHAN		Σ MARKAH
6	(*a*) $1+\frac{1}{2x^2}=3$	K1	7
	$x=\pm\frac{1}{2}, x=\frac{1}{2}(>0)$		
	$x=\frac{1}{2}, y=\frac{5}{2}$ or $P\left(\frac{1}{2},\frac{5}{2}\right)$	N1	
	$y-\frac{5}{2}=-\frac{1}{3}\left(x-\frac{1}{2}\right)$ OR $\frac{5}{2}=-\frac{1}{3}\left(\frac{1}{2}\right)+c$	K1	
	$y=-\frac{1}{3}x+\frac{8}{3}$	N1	
	(*b*) $y=x-\frac{1}{2x}+c$	K1 kamiran	
	$\frac{5}{2}=\frac{1}{2}-\frac{1}{2(\frac{1}{2})}+c$	K1	
	$y=x-\frac{1}{2x}+3$	N1	

No.	PERATURAN PEMARKAHAN		Σ MARKAH
7	(*a*) 0.7855 rad	N1	10
	(*b*) 6 (1.571) or 6 (2.3565)	K1	
	$PQ^2 = 6^2 + 6^2 - 2(6)(6)\cos 135^\circ$	K1	
	Perimeter = $6 + 6 + 6\,(1.571) + 6\,(2.357) + \sqrt{6^2 + 6^2 - 2(6)(6)\cos 135^\circ}$	K1	
	= 46.66 cm // 46.65cm	N1	
	(*c*) $\frac{1}{2}(6)^2(1.571)$ or $\frac{1}{2}(6)^2(2.357)$	K1	
	Luas segitiga = $\frac{1}{2}(6)(6)(\sin 135^\circ)$	K1	
	$\frac{1}{2}(6)^2(2.357 - \sin 135^\circ)$	K1 luas tembereng	
	Area = $\frac{1}{2}(6)^2(1.571) + \frac{1}{2}(6)^2(2.357 - \sin 135^\circ)$	K1	
	57.98 cm^2 // 57.97	N1	

No.	PERATURAN PEMARKAHAN		Σ MARKAH
8	(a) $11 = p(2)^2 + q$	K1	10
	$\left(\frac{px^3}{3} + qx\right)_0^2 = \frac{34}{3}$	K1	
	$4p + q = 11$, $\frac{8}{3}p + 2q = \frac{34}{3}$ dan selesaikan	K1	
	$p = 2$ dan $q = 3$	N1	
	(b) $\frac{dy}{dx} = 4x$ dan ganti x =2	K1	
	$11 = 8(2) + c$ or $y - 11 = 8(x - 2)$	K1	
	$y = 8x - 5$	N1	
	(c) $\int_3^6 \pi\left(\frac{y-3}{2}\right) dy$	K1	
	$\frac{\pi}{2}\left(\frac{y^2}{2} - 3y\right)_3^6$	K1	
	$\frac{9}{4}\pi$	N1	

No. 9

x^2	1	4	9	12.25	16	25	N1
$\frac{y}{x}$	-0.17	0.34	1.17	1.71	2.33	3.83	N1



Using the correct, uniform scale and axes K1
All points plotted correctly N1
Line of best fit N1

b) $\frac{y}{x} = \frac{(h+2)}{6}x^2 - \frac{k}{6}$ P1

i) use $m = \frac{(h+2)}{6}$ K1

$h = -1.01$ N1

ii) use $c = -\frac{k}{6}$ (c : - 0.3 $\leftrightarrow$ - 0.33) K1

$k = 1.8$ N1

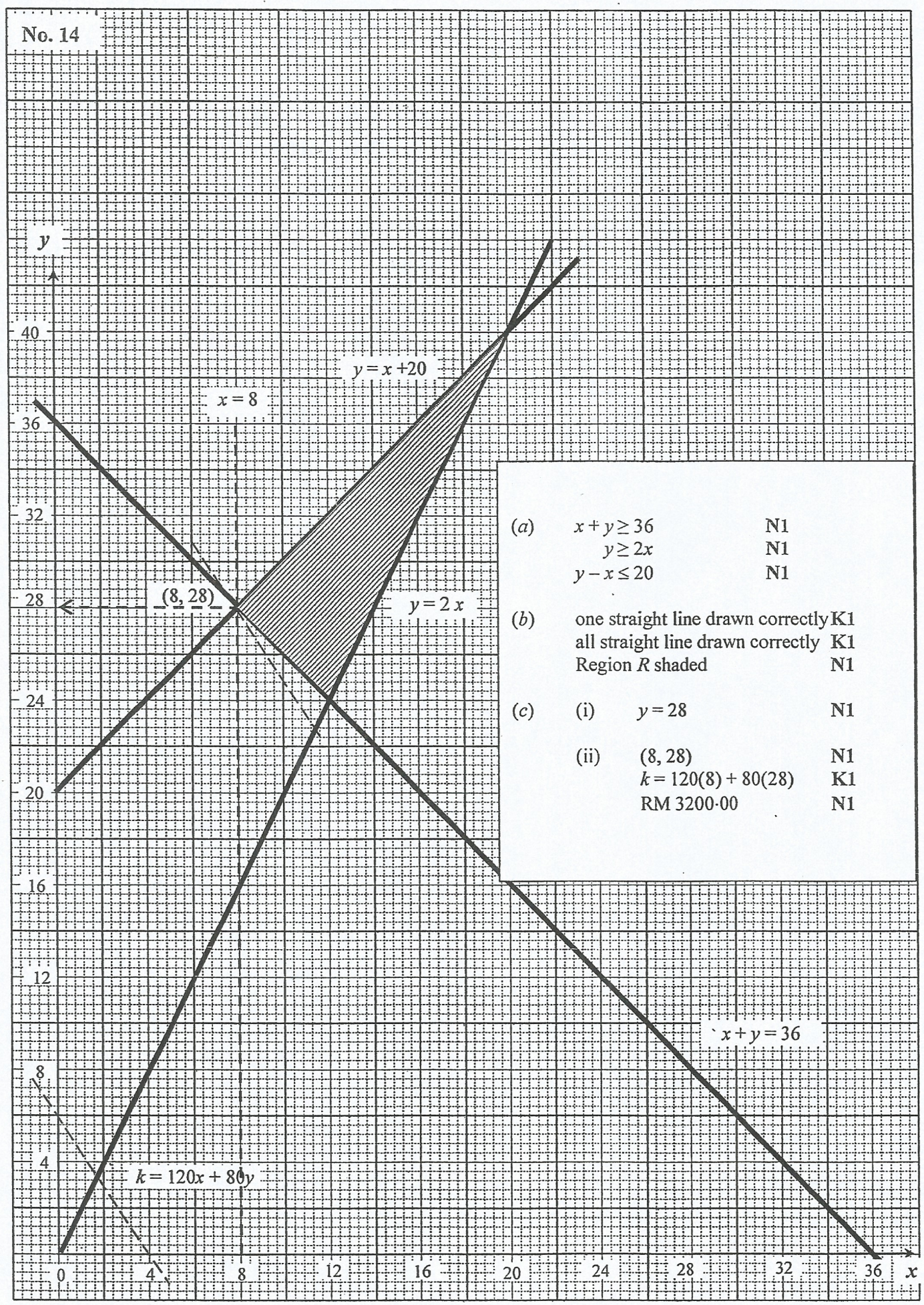
No.	PERATURAN PEMARKAHAN		Σ MARKAH
10	(*a*) (i) $P(X=8)={}^{12}C_8(0.6)^8(0.4)^4$	K1	10
	$=0.2128$	N1	
	(ii) $P(X<3)=P(X=0)+P(X=1)+P(X=2)$	P1	
	$={}^{12}C_0(0.6)^0(0.4)^{12}+{}^{12}C_1(0.6)^1(0.4)^{11}+{}^{12}C_2(0.6)^2(0.4)^{10}$	K1	
	$=0.00281$	N1	
	(*b*) (i) $P\left(z\le\frac{4.5-4.2}{0.8}\right)$	K1	
	$=0.6462$	N1	
	(ii) $P\left(z>\frac{m-4.2}{0.8}\right)=0.6$		
	Baca sifir $Q(z)$, - 0.253 dilihat	P1	
	$\frac{m-4.2}{0.8}=-0.253$	K1	
	$m=3.9976\,kg$	N1	

No.	PERATURAN PEMARKAHAN	Σ MARKAH
11	(a) (i) $\frac{p-5}{6-3}=-\frac{1}{3}$ K1 $p=4$ N1 (ii) $y-5=-\frac{1}{3}(x-3)$ K1 atau menggunakan $y=mx+c$ $y=-\frac{1}{3}x+6$ N1 atau setara (iii) $\frac{1}{2}\lvert(-42+30)-(-84+12)\rvert$ K1 $=30$ N1 (b) (i) $\sqrt{(x-3)^2+(y-5)^2}=2\sqrt{(x-6)^2+(y-4)^2}$ K1 menggunakan $WK=\frac{1}{2}WJ$ atau $WJ=2WK$ $3x^2+3y^2-42x-22y+174=0$ N1 (ii) $3y^2-22y+174=0$ dan $(-22)^2-4(3)(174)=-1604$ K1 $b^2-4ac<0$, tiada punca..... maka tidak memintas paksi-y N1	10

No.	PERATURAN PEMARKAHAN	Σ MARKAH
12	(a) **Guna** $\frac{Q_{2018}}{Q_{2017}} \times 100$ untuk mana-mana satu yang betul **K1** $x = \frac{28.50}{25.00} \times 100$ **atau** $\frac{y}{8.00} \times 100 = 140$ **atau** $\frac{4.80}{z} \times 100 = 120$ $x = 114$ **N1** $y =$ (RM) 11.20 **N1** $z =$ (RM) 4 **N1** (b) $\bar{I} = \frac{(114)(10)+(125)(30)+(140)(25)+(112.5)(15)+(120)(20)}{100}$ **K1** $= 124.78$ **N1** (c) $\frac{x}{2.50} \times 100 = 124.78$ **K1** $x = 311.95$ **N1** (RM) 9670.45 **N1** (d) $\frac{124.78 \times 114}{100}$ **K1** 142.25 **N1**	10

No.	PERATURAN PEMARKAHAN		Σ MARKAH
13	(a) (i) $\frac{\sin \angle ABC}{10} = \frac{\sin 27^\circ}{5}$	K1	10
	65.23°	N1	
	$\angle ABC = 114.77$	N1	
	(ii) $6^2 = 5^2 + 5^2 - 2(5)(5)\cos \angle CDE$	K1	
	$\angle CDE = 73.74^\circ$	N1	
	(iii) $\frac{1}{2} \times 5 \times 10 \times \sin 38.23^\circ$ OR $\frac{1}{2} \times 5 \times 5 \times \sin 73.74^\circ$	K1	
	$\frac{1}{2} \times 5 \times 10 \times \sin 38.23^\circ + \frac{1}{2} \times 5 \times 5 \times \sin 73.74^\circ$	K1	
	27.47	N1	
	(b) $\sin 65.23^\circ = \frac{x}{5}$ or $\sin 27^\circ = \frac{x}{10}$	K1	
	4.54	N1	

No. 14



(*a*)	$x + y \geq 36$		N1
	$y \geq 2x$		N1
	$y - x \leq 20$		N1
(*b*)	one straight line drawn correctly		K1
	all straight line drawn correctly		K1
	Region *R* shaded		N1
(*c*)	(i)	$y = 28$	N1
	(ii)	(8, 28)	N1
		$k = 120(8) + 80(28)$	K1
		RM 3200·00	N1

No.	PERATURAN PEMARKAHAN	Σ MARKAH
15	(a) $\frac{dv}{dt}=2-2t$ and $-(t+2)(t-4)=0$ **K1** Solve $8+2t-t^2=0$	
	$2-2(4)$ **K1** Substitute $t=4$ into $\frac{dv}{dt}$*	
	-6 **N1**	
	(b) solve $2-2t=0$ **K1**	
	$8+2(1)-(1)^2$ **K1** Substitute $t=1$ into v	
	9 **N1**	
	(c) $8t+t^2-\frac{t^3}{3}$ **K1 integrate**	
	$\left(8(4)+(4)^2-\frac{(4)^3}{3}\right)-\left(8(0)+(0)^2-\frac{(0)^3}{3}\right)$ or $\left(8(10)+(10)^2-\frac{(10)^3}{3}\right)-\left(8(4)+(4)^2-\frac{(4)^3}{3}\right)$ **K1** or equivalent	
	$\left(8(4)+(4)^2-\frac{(4)^3}{3}\right)-\left(8(0)+(0)^2-\frac{(0)^3}{3}\right)+\left\|\left(8(10)+(10)^2-\frac{(10)^3}{3}\right)-\left(8(4)+(4)^2-\frac{(4)^3}{3}\right)\right\|$ **K1**	
	$206\frac{2}{3}$ **N1**	