Program Peningkatan Prestasi Sains & Matematik 2009
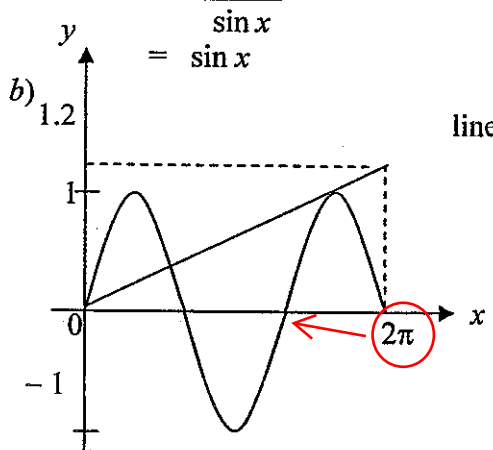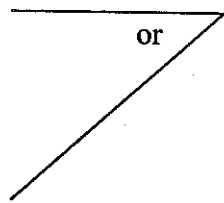**Additional Mathematics Marking Scheme - Paper 2**
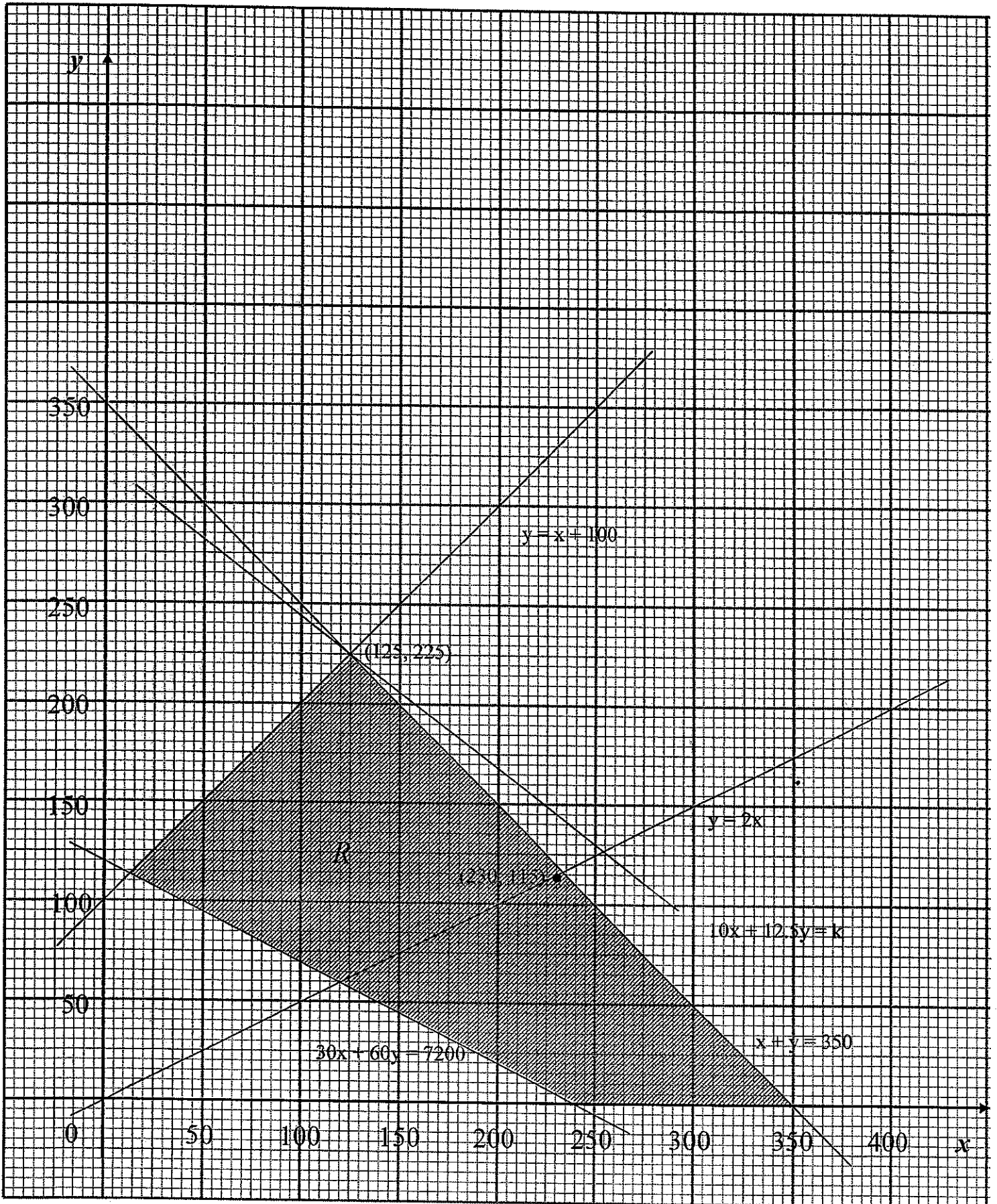
Solution	Marks	Solution	Marks
1. $y = 1 - 2x$ atau $x = \dfrac{1-y}{2}$	P1	2. a) $f(x) = 2x^2 - hx - k$	
$y^2 - x^2 + xy = 11$		$= 2\left(x^2 - \dfrac{h}{2}x\right) - k$	
$(1-2x)^2 - x^2 + x(1-2x) = 11$ or	K1	$= 2\left[x^2 - \dfrac{h}{2}x + \left(-\dfrac{h}{4}\right)^2 - \left(-\dfrac{h}{4}\right)^2\right] - k$	K1
$y^2 - \left(\dfrac{1-y}{2}\right)^2 + \left(\dfrac{1-y}{2}\right)y = 11$		$= 2\left(x - \dfrac{h}{4}\right)^2 - \dfrac{h^2}{8} - k$	N1
$y^2 + 4y - 45 = 0$			
$x^2 - 3x - 10 = 0$		$-1 - \dfrac{h}{4} = 0$ or $-\dfrac{(-4)^2}{8} - k = 13$	K1
$(x-5)(x+2) = 0$ or	K1	$h = -4$	N1
$(y-5)(y+9) = 0$		$k = -15$	N1
$x = 5, x = -2$	N1		
$y = -9, y = 5$	N1	b) $f(x) \geq 31$	K1
		$x^2 + 2x - 8 \geq 0$	N1
	$\overline{5}$	$x \leq -4, x \geq 2$	
			$\overline{7}$
3. a) $T_7 = 560 + (7-1)81.2$	K1	4. a) LHS: $\operatorname{cosec} x - \cos^2 x \operatorname{cosec} x$	
$= 1047.20$	N1	$= \dfrac{1}{\sin x} - \dfrac{\cos^2 x}{\sin x}$	
b) $S_7 = \dfrac{560[(\frac{3}{2})^7 - 1]}{\frac{3}{2} - 1}$	K1	$= \dfrac{\sin^2 x}{\sin x}$	
$= 18016.25$	N1	$= \sin x$	K1
c) $S_7 = \dfrac{7}{2}[2(560 + (7-1)81.2]$	K1	b)	N1
$= 5625.2$			K1
Diff $= 18016.25 - 5625.2$	K1		
$= 12391.05$	N1		
	$\overline{7}$	Shape of graph $\sin x$	
		Min $= -1$, Max $= 1$	P1
		Correct magnitud within	P1
		$0 \leq x \leq 2\pi$	P1
		$y = \dfrac{3x}{5\pi}$	N1
		Number of solution $= 3$	N1
		Correction: No. of solution= 2	$\overline{8}$

5.

| 7 | 19 | 33 | 42 | 48 |

Seen 20.5/ 7 / 12

$$Q1 = 20.5 + \left[\frac{12-7}{12}\right]10$$

$$= 24.6667 \text{ or } 24\frac{2}{3}$$

Seen 40.5 / 33 / 9

$$Q3 = 40.5 + \left[\frac{36-33}{9}\right]10$$

$$= 43.8333 \text{ or } 43\frac{5}{6}$$

Inter-quartile range 43.83 - 24.6667

$$= 19.1667 \text{ or } 19\frac{1}{6}$$

N1
P1
K1

P1

K1
N1
—
6

6. *a)* i) $\overrightarrow{SR} = -\underline{x} - \underline{y}$

ii) $\overrightarrow{QU} = -\underline{x} + \frac{1}{2}\left(-\underline{x} - 3\underline{y}\right)$

$$= -\frac{3}{2}(\underline{x} + \underline{y})$$

b) i) $-\frac{3}{2}(\underline{x}+\underline{y}) = -2m(\underline{x}+\underline{y})$

$$m = \frac{3}{4}$$

ii) $\frac{1}{2}(12)(\ell) = 80$

$$\ell = \frac{40}{3} \text{ or } 13.33 \text{ cm}$$

N1
K1

N1

K1
N1

K1

N1
—
7

7 a) at (4,7) , $x = 4$, $y = 7$

$\Rightarrow 7 = 4^2 - k$

$k = 9$

when $y = 0$

$0 = x^2 - 9$

$x = 3$

$P(3, 0)$

b) Area $= \int_3^4 (x^2 - 9)dx + \int_0^3 (x^2 - 9)dx$

$$= \left[\frac{x^3}{3} - 9x\right]_3^4 + \left[\frac{x^3}{3} - 9x\right]_0^3$$

$$= \left|3\frac{1}{3}\right| + |-18|$$

$$= 21\frac{1}{3} unit^2$$

c) when $x = 0$, $y = 0^2 - 9 = -9$

$$V = \pi \int_{-9}^{0} (y+9)dy$$

$$= \pi \left[\frac{y^2}{2} + 9y\right]_{-9}^0 \quad \text{(Integrate + limit)}$$

$$= 121\frac{1}{2} \pi unit^3$$

N1

N1

K1
K1K1

N1

K1

K1K1

N1
—
10

8 a)

x^2	1	2.25	4.00	5.48	6.25	7.51
$\frac{1}{y}$	0.51	0.60	0.72	0.83	0.89	0.98

b) Refer graph
  Correct & consistent scale
  All 6 points plotted correctly
  Line of best fit

c) i) $\frac{1}{y} = \frac{x^2}{k} + \frac{p}{k}$

$$\frac{1}{k} = \frac{0.98 - 0.43}{7.50 - 0}$$

$$k = 13.6364$$

ii) $\frac{p}{k} = 0.43$

$$p = 5.8637$$

N1
N1

K1
N1
N1

P1

K1

N1

K1

N1
—
10

9 a) $\dfrac{OC}{\sin 30^0} = \dfrac{12}{\sin 75^0}$ or   K1

$OC = \dfrac{12}{\sin 75^0 \, x \sin 30^0}$

$= 6.2117 \text{ cm}$ or   N1

or $\cos 75^0 = \dfrac{OM}{12}$

$OC = 2(12 \, x \cos 75^0) = 6.2117$

b) $S_{AC} = 12(60 \times \dfrac{\pi}{180})$

$= 12.568 \text{ cm}$ or   K1

$S_{ABC} = 6.2117 \times (210 \times \dfrac{\pi}{180^0})$

$= 22.7700 \text{ cm}$

Perimeter $= 12.568 + 22.7700$ K1

$= 35.338 \text{ cm}$ N1

c) Area of sector $OABC$

$= \dfrac{1}{2}(6.2117)^2(210 \times \dfrac{\pi}{180^0})$ K1

$= 70.7203 \text{ cm}^2.$

$\angle OPC = 30^0$ P1

Area of segment AO

$= \dfrac{1}{2}(12)^2(\dfrac{30^0}{180^0}\pi - \sin 30^0)$ K1

$= 1.704 \text{ cm}$

Area of shaded region

$= 70.7203 - 2(1.704)$ K1

$= 67.3123 \text{ cm}^2.$ N1

10

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10 a) P is the midpoint of AC

$P\left[\left(\dfrac{x+2}{2}\right),\left(\dfrac{y-5}{2}\right)\right] = (0,-1)$ K1

$C(-2,3)$ N1

$P\left[\dfrac{1(6)+3x}{1+3},\dfrac{1(2)+3y}{1+3}\right] = (0,-1)$ K1

$D(-2,-2)$ N1

b) $m = \dfrac{-2-(-1)}{-2-0} = \dfrac{1}{2}$ K1

$\dfrac{y-(-2)}{x-(-2)} = \dfrac{1}{2}$ K1

$2y = x - 2$ N1

c) Midpoint $(0, -\dfrac{7}{2})$ P1

$m = -\dfrac{3}{4}, \quad m = \dfrac{4}{3}$ K1

$y = \dfrac{4}{3}x - -\dfrac{7}{2}$ N1

10

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11 a) i) $p = \dfrac{1}{6}, \quad q = \dfrac{5}{6}$

$P(X=2) = {}^{10}C_2\left(\dfrac{1}{6}\right)^2\left(\dfrac{5}{6}\right)^8$ K1

$= 0.2907$ N1

ii) $P(X \le 2) =$

$= P(X=0) + P(X=1) + P(X=2)$

$= \left(\dfrac{5}{6}\right)^{10} + {}^{10}C_1\left(\dfrac{1}{6}\right)\left(\dfrac{5}{6}\right)^9 + 0.2907$ K1K1

$= 0.7752$ N1

b) $X \sim N(45, 25^2)$

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12 a) when $t = 0$,

$s = 5(3)^2 - 2(3)^3 + p = 0$ K1

$p = 9$ N1

b) $v = \dfrac{ds}{dt} = 10t - 6t^2$ K1

$a = \dfrac{dv}{dt} = 10 - 12t = 0$ K1

$t = \dfrac{5}{6}$

$v_{max} = 10(\dfrac{5}{6}) - 6(\dfrac{5}{6})^2$ K1

$= 4\dfrac{1}{6}$ N1

i) $P(X \geq 40)$ $= P\left(Z > \dfrac{40-45}{25}\right)$	K1	c) $v = \dfrac{ds}{dt} = 10t - 6t^2 = 0$ $t = \dfrac{5}{3}$	K1
$= P(Z > -0.2) = 0.5793$ $0.5793 \times 1000 \approx 579$ students	N1		
ii) $P(X > m) = 0.16$ $P\left(Z > \dfrac{m-45}{25}\right) = 0.16$	K1	$t = \dfrac{5}{3}, \; s = 13\dfrac{17}{27}$ or $t = 2, \; s = 13$	K1
		$d = 13\dfrac{17}{27} + (13\dfrac{17}{27} - 13)$	K1
$\dfrac{m-45}{25} = 0.994$ $m = 69.85 \;(\text{accept } 70)$	K1 N1	$= 14\dfrac{7}{27}\,m$	N1
	$\overline{10}$		$\overline{10}$

13 a) $29 = \dfrac{1}{2}(6)(10)\sin \angle DCB$	K1	14 a) $\dfrac{24}{x}(100) = 110$ $x = 21.82$ or	K1
$\sin \angle BCD = 0.9667$ $\angle BCD = 104.84^0$	N1	$\dfrac{z}{9.50}(100) = 130$ $z = 12.35$ (3 Ans. correct)	N2 or N1
b) $BD^2 = 6^2 + 10^2 -$ $\qquad 2(6)(10)\cos 104.84^0$ $= 166.7345$ $BD = 12.9126$	K1 N1	or $y = \dfrac{18}{12}(100)$ (2 Ans. correct) $= 150$	
c) i) $\dfrac{\sin \angle BAD}{12.9126} = \dfrac{\sin 45^0}{9.5}$ $\angle BAD = 70.97^0$ $\angle BA'D = 106.03^0$	K1 N1 N1	b) i) $\sum iw = 110(230) + 116(520) +$ $\qquad 150(380) + 130(670) +$ $125(200)$	P1 K1
ii) $\angle ABD = 61.03^0$ Area of $\triangle ABD$ $= \dfrac{1}{2}(9.5)(12.9126)\sin 61.03^0$ $= 53.6602$	K1	$\bar{I} = \dfrac{254720}{2000}$ $= 127.36$	N1
Area of quadrilateral $= 29 + 53.6602$ $= 82.6602$	K1 N1	ii) $\dfrac{Q_{2007}}{4500} \times 100 = 127.36$ $Q_{2007} = 57312.00$	K1 N1
		c) $I_{\frac{08}{05}} = \dfrac{120}{100} \times 127.36$ $= 152.83$	K1 N1
	$\overline{10}$		$\overline{10}$

15a) I : $3x + 6y \geq 7200$	N1	15 c) i) maximum $Q = 115$	N1
II : $y \leq x + 100$	N1		
III: $x + y \leq 350$	N1	ii) (125, 225)	N1
b) refer graph		Total profit $= 10(125) + 12.50(225)$	K1
- Use correct and consistant scale + draw a line correctly	K1	$= RM\ 4062.50$	N1
- Draw the three lines correctly	N1		
- correct region	N1		$\overline{10}$

Graph for Question 15

y

$y = x + 100$

$(125, 225)$

$y = 2x$

R

$(250, 115)$

$10x + 12.5y = k$

$30x + 60y = 7260$

$x + y = 350$

350

300

250

200

150

100

50

0   50   100   150   200   250   300   350   400 x

$\dfrac{1}{y}$

Graph $\dfrac{1}{y}$ against x^2

Graph axis labels: vertical axis $\dfrac{1}{y}$ with values 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0; horizontal axis x^2 with values 1, 2, 3, 4, 5, 6, 7, 8.