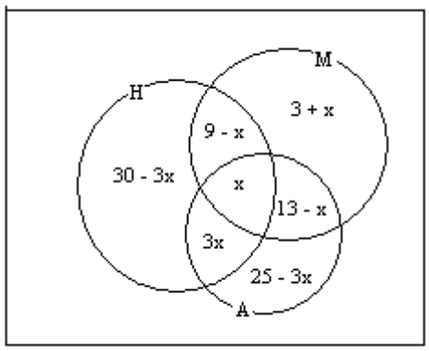
HARRISON COLLEGE PROMOTION EXAMINATIONS 2011 : 4th Form

SOLUTIONS AND MARK SCHEME

Question	Working	Marks & comments
1.(a)		7 [1 mark for each area correctly enumerated in terms of "x".] 7
(b)	$80 - 3x = 65$ $x = 5$	1 [for summing **his** terms from 1(a) **AND** equating to 65] 1 [correct answer **only**] 2
2 (a)	$k = \sqrt{3w + a}$ $k^2 = 3w + a$ $k^2 - a = 3w$ $w = \frac{k^2 - a}{3}$	1 [c.a.o] 1 [c.a.o] 1 [c.a.o] 3
(b) (i)	$2m - 5x - xm + 10 = 2m - xm - 5x + 10$ $= m(2 - x) + 5(-x + 2)$ $= (2 - x)(m + 5)$	1 + 1 1[correct answer **only**] 3
(b) (ii)	$\frac{x^2 - 4}{2x^2 - x - 6} = \frac{(x + 2)(x - 2)}{(2x + 3)(x - 2)}$ $= \frac{(x+2)}{(2x+3)}$	1 [factorizing the numerator] 1 [factorizing the denominator] 1 3
3.	$x^2 + y^2 = 17$; $y = x - 3$ $y^2 = x^2 - 6x + 9$ $x^2 + x^2 - 6x + 9 = 17$ $2x^2 - 6x - 8 = 0$ $(2x + 2)(x - 4) = 0$ $\Rightarrow x = -1 \quad x = 4$ $y = -4 \quad y = 1$ Answer: $(-1, -4)$ and $(4, 1)$	1 [attempting squaring expression AND substituting] 1 [for correctly simplifying] 1 [for factorizing correctly] 1 + 1 [c.a.o] 1 + 1 [c.a.o] 7

4.(i)	$f(x) = x^2 - 16x + 4$ $f(x) = x^2 - 16x + (-8)^2 + 4 - (-8)^2$ $f(x) = (x-8)^2 - 60$	1 + 1 + 1 3
(ii)	$x = 8 \quad y = -60$	1 + 1 [correct answers based on **his** expression in 4(i)] 2
(iii)	$x = \frac{16 \pm \sqrt{16^2 - 4(1)(4)}}{2(1)}$ $x = \frac{16 \pm 15.49}{2}$ $x = 0.26$ $x = 15.75$	1 [correct use of quadratic formula] 1 [maximum of 2 marks for correct use of his expression from 4(i)] 1 [c.a.o] 1 [c.a.o] 4
5. (a)	$m_{l1} = \frac{-2-1}{6-1} = \frac{-3}{5} = -0.6$	1 + 1 2
(b)	$m_{l2} = \frac{5}{3}$ $y = \frac{5}{3}x + c$ or $(y - y_1) = \frac{5}{3}(x - x_1)$ $9 = \frac{5}{3}(-1) + c$ or $(y - 9) = \frac{5}{3}(x + 1)$ $c = \frac{32}{3}$	1 [gradient of l_2 – correct use of his value from 5(a)] 1[setting up the equation of a straight line.] 1 [substituting coordinates correctly into one form of the equation of a straight line] 3

6.(a)	$f(x) = \frac{5x-2}{x}$ $y = \frac{5x-2}{x}$ $x = \frac{5y-2}{y}$ $xy = 5y - 2$ $xy - 5y = -2$ $y(x-5) = -2$ $y = f^{-1}(x) = \frac{-2}{x-5}$ or $\frac{2}{5-x}$	1 1 1 1 1 [c.a.o] 5
(b)	$gf(2) = g\left[\frac{10-2}{2}\right]$ $= g(4) = 16$	1 [attempting to find *f(2)* first seen or implied] 1 [correct answer only] 2

7(i)	$AC^2 = 6.5^2 + 2.5^2 = 48.6$ $AC = 6.96$	1 [use of Pythagoras rule/cosine rule] 1 [correct answer only] 2
(ii)	$BC^2 = 5^2 + 6.96^2 - 2 \times 5 \times 6.96 \times \cos 60$ = $BC^2 = 38.64$ $BC = 6.22$	1 [for use of cosine rule] 1 [for correct substitution of **his** value of AC AND the 60^o] 1 [correct evaluation of his expression] 3
(iii)	$\frac{\sin ABC}{6.96} = \frac{\sin 60}{6.22}$ $\sin ABC = 0.9691$ $angle\ ABC = 75.7^o$	1 [use of either sine or cosine rule correctly] 1 [correct use of **his** lengths (i.e.AC and BC) **and/or** 60^0] 1 [correct evaluation of his expression] 3
8. (i)	$2P - Q = 2\begin{bmatrix}5 & -1\\3 & 8\end{bmatrix} - \begin{bmatrix}7 & 8\\-2 & 6\end{bmatrix}$ $= \begin{bmatrix}10 & -2\\6 & 4\end{bmatrix} - \begin{bmatrix}7 & 8\\-2 & 6\end{bmatrix} = \begin{bmatrix}3 & -10\\8 & -2\end{bmatrix}$	1 [for multiplying P by 2 correctly] 1 [correct answer only] 2
(ii)	PQ = $\begin{bmatrix}5 & -1\\3 & 4\end{bmatrix}\begin{bmatrix}7 & 8\\-2 & 6\end{bmatrix} = \begin{bmatrix}37 & 34\\13 & 48\end{bmatrix}$	4 marks [1 for each correct element] 4
9.(i)	$\overline{SQ} = 2\boldsymbol{b} - 4\boldsymbol{a}$	1 1
(ii)	$\overline{QR} = \overline{QP} + \overline{PS} + \overline{SR}$ **or** $\overline{QS} + \overline{SR}$ $= -2\boldsymbol{b} + 4\boldsymbol{a} + 2\boldsymbol{a} + \boldsymbol{b}$ $= 6\boldsymbol{a} - \boldsymbol{b}$	1 1 1 3
(iii)	$\overline{PT} = h\,\overline{PR} = h\,(\overline{PS} + \overline{SR})$ $= h(4\boldsymbol{a} + 2\boldsymbol{a} + \boldsymbol{b})$ $= h(6\boldsymbol{a} + \boldsymbol{b})$	1 1 2
(iv)	$\overline{ST} = \frac{1}{4}\overline{SQ} = \frac{1}{4}(2\boldsymbol{b} - 4\boldsymbol{a}) = \frac{1}{2}\boldsymbol{b} - \boldsymbol{a}$ $\overline{ST} = \overline{PT} - 4\boldsymbol{a} = h(6\boldsymbol{a} + \boldsymbol{b}) - 4\boldsymbol{a} = (6h - 4)\boldsymbol{a} + h\boldsymbol{b}$ $(6h - 4)\boldsymbol{a} + h\boldsymbol{b} = \frac{1}{2}\boldsymbol{b} - \boldsymbol{a}$ $h = \frac{1}{2}$	1 [use of his $\overline{ST}$] 1 1 [equating ST's or SQ's and attempting to solve for *h*] 1 [c.a.o] 4