KENT RIDGE SECONDARY SCHOOL
Preliminary Examination P1 2022

Marking Scheme

MATHEMATICS **4048/01**

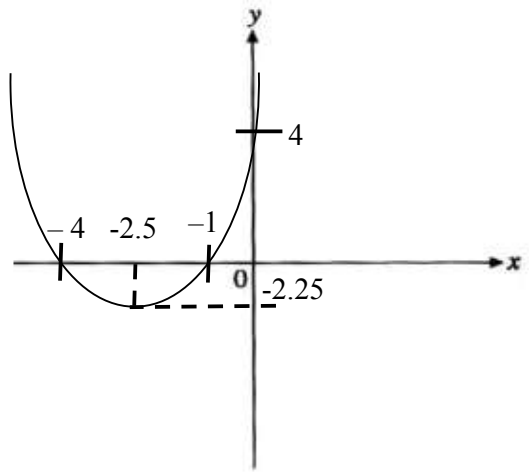
SECONDARY 4 EXPRESS/ 5 NORMAL ACADEMIC

18 August 2022 **2 hours**

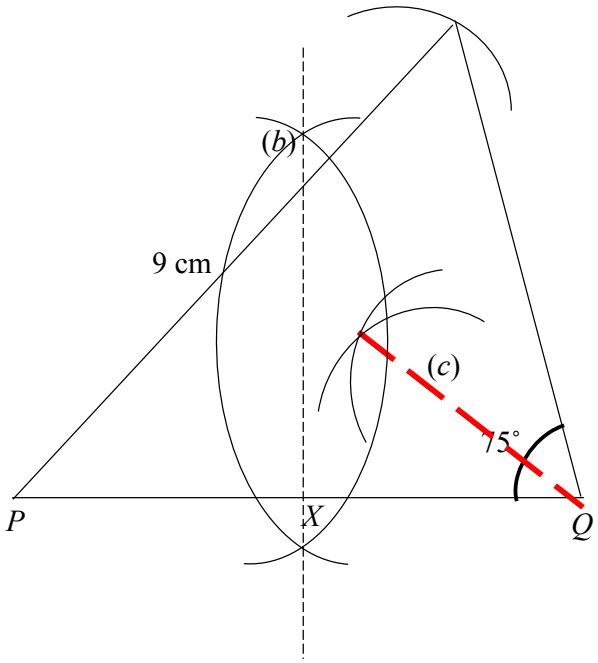
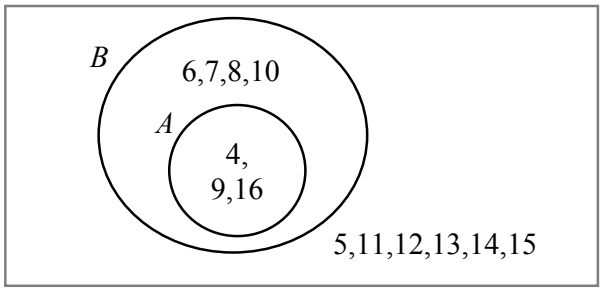
Question	Solution	Mark/ Remark
Q1	-0.876	[B1]
Q2 (a)	$y = k(3x + 7)^2$ $6 = k(-12 + 7)^2$ $k = 6/25$ or 0.24 $y = 0.24(3x + 7)^2$ OR $y = 6/25(3x + 7)^2$	[M1] [A1]
Q2(b)	$15.36 = 0.24(3x + 7)^2$ $64 = (3x + 7)^2$ $3x + 7 = 8$ or -8 $x = 1/3$ or $x = -5$	 [M1 15.36 ÷ their k seen] [A1 both answer must be seen]
Q3	$\frac{4}{aw^2} \div \frac{16a^3}{5w}$ $= \frac{4}{aw^2} \times \frac{5w}{16a^3}$ $= \frac{5}{4wa^4}$	 [M1× and 5/4 seen] [A1]

Q4	1. The scale on the vertical axis does not start from zero. 2. The scale on the axes are inconsistent/ not equally spaced, therefore projection of the profit will be inaccurate. 3. Data from 2013 to 2022 cannot be used to predict future profit. 4. 2015 to 2022 is not linear.	[B1 for point 1 only] [B1 Either point 2 or 3 or 4 only]
Q5	Ratio of the side regular hexagon : equilateral triangle = 7: 3 Ratio of the perimeters hexagon : triangle = 7 × 6 : 3 × 3 = 42: 9	
Q6	Let x be the time taken in hour when they meet $70x + 50x = 100$ $120x = 100$ $x = 5/6$ hours = 50 minutes 0800 + 0050 = 0850 They will meet at 0850 or 8.50 am **OR** Let y be the distance $(100 – y) / 50 = y / 70$ $50y = 7000 - 70y$ $120y = 7000$ $y = 700/12$ time taken = (700/12) /70 = 5/6 hours = 50 minutes 0800 + 0050 = 0850 They will meet at 0850 or 8.50 am	 [M1] [M1 5/6 h or 50 min] [A1] [M1] [M1 distance /speed] [A1]
Q7 (a)	4/5 or 0.8 or 80%	[B1] [B0 for 8/10]
Q7(b)	$r + s = 8$ $r \times s$ = Prime therefore $r = 1$ and $s = 7$ P(choosing a red ball) = 0.1 or 1/10	 [M1 able to deduce 1 and 7] [A1]

Q8	$\frac{x}{3} - \frac{3x-7}{4} = 8$ $\frac{4x}{12} - \frac{9x-21}{12} = 8$ $4x - 9x + 21 = 96$ $-5x = 75$ $x = -15$	[M1 common deno] [M1 multiply by 12 and allow 1 slip, the slip cannot be the negative sign] [A1]
Q9(a)	$-8a - 4b + 7b - 21a$ $= 3b - 29a$	[M1 any 2 terms are expanded correctly]
Q9 (b)	$= 6x(2y + x) - (2y + x)$ $= (6x - 1)(2y + x)$	[M1 allow 1 slip] [A1] [A0 if 1 slip is found]
Q10	$3b + 8d = 2ab + 5$ $3b - 2ab = 5 - 8d$ $b(3 - 2a) = 5 - 8d$ $b = \frac{5-8d}{(3-2a)}$	[M1 regroup **and** factorise b] [A1]
Q11	$7/9 \times 1440 = 1120$ $\frac{1}{3} : \frac{5}{6} : 0.5 = 2 : 5 : 3$ 10 units represent 1120 5 units represent 560 OR $\frac{\frac{5}{6}}{(\frac{1}{3}+\frac{5}{6}+\frac{1}{2})} \times 1120 = 560$	[M1 for 1120 or 2: 5: 3 is seen] [A1] [M1 + A1]

Q12 (a)	$x^2 + 5x + 4$ $= (x + 2.5)^2 - 2.25$	[B1 $(x + 2.5)^2$ B1 –2.25 if not working is shown]
Q12(b)	 	[C1 shape (min curve) [P1 1. cuts at the x axis at -1 and -4 with min shape 2. cuts at y axis at 4.
Q12(c)	Min pt (-2.5, -2.25)	[B1 or ECF 1 from (a)]
Q13 (a)	$6.3 \times 10^7 - 4.7 \times 10^6 = 58300000$ $58300000 = 5.83 \times 10^7$	[M1 showing subtraction] [A1 for conversion to standard form] [A0 if 5.8×10^7]
Q13(b)	£5.88 ÷ 5 = £1.176 £1 = SGD $1.70 £1.176 = SGD $1.9992 2.98 – 2.00 = 0.98 United Kingdom is cheaper and by SGD$0.98.	[M1 for comparing 1 litre] [M1 conversion of pound to SGD] [A1 must show UK and **SGD**$0.98]
Q14	$x = 0.8m$ $y = 1.3n$ $x/y = 0.8m/1.3n$ $x/y = 8m/13n$ $8m/13n < m/n$	[M1 for 0.8 or 1.3 shown] [M1 able to show the fraction of x/y OR ECF 1 for their version of fractions]

	Thus, x/y is lesser than m/n	[B1 must say lesser and show comparison between 8m/13n and m/n] [No B1 if they just conclude]
Q15	r/4 or 40 $2200 = 950\,(1+(r/4)/100)^{10x4}$ $2.315789474 = (1+r/400)^{40}$ $\sqrt[40]{2.315789474} = (1+\frac{r}{400})$ $1.021215686 - 1 = r/400$ $0.021215686 \times 400 = 8.49$ $r = 8.49$	[B1] [M1 $\div$ *by their* $\sqrt[x]{y}$ [A1]
Q16(a)	$4(2^a) = 32$ $2^a = 8$ $a = 3$	[M1 able to show 4 or 2^2] [A1]
Q16(b)	$5^{2(x+2)} \times 5^3 \div 5^{-x} = 5^0$ $5^{(2x+4)+3+x} = 5^0$ $3x + 7 = 0$ $x = -7/3$	[M1 to show $1 = 5^0$ or $5^{2(x+2)} \times 5^3$ [M1 use indices law to combine the power] [A1]

Q17(a)		(a) [C1 for the arc] [G1 for the triangle with $PR = 9$ cm ± 0.1 cm and $\angle PQR = 75^\circ$ ±1°] (b) [G1 at PX with 4 cm ± 0.1] (c) [G1 at ∠Q with 37.5°±1°]
Q18(a)	ξ 	[C2 – all correct]
Q18(b)	A= {x : x is a **perfect square**}	[B1 bold keyword]
Q18(c)	$A \cap B' = \{\ \}$ or ϕ	[B1] No B1 for {ϕ}
Q19 (a)	2 cm : 1 km 17 cm : 8.5 km	[B1]
Q19(b)	4 cm^2 : 1 km^2 1 cm^2 : 0.25 km^2 9 cm^2 : 2.25 km^2	[M1 conversion] [A1]

Q20 (a)(i)	$756 = 2^2 \times 3^3 \times 7$	[M1+ A1]
Q20(a) (ii)	$360 = 2^3 \times 3^2 \times 5$ $756 = 2^2 \times 3^3 \times 7$ HCF $= 2^2 \times 3^2$ $= 36$	 [B1] [B0 index notation]
Q20 (b)	$m = 11$ $n = 3$	[B1] [B1]
Q21 (a)	$8 - 3.5 = 4.5$ OR By Pythagoras' theorem, $OD^2 = 8^2 - (6.61)^2$ $OD \approx 4.5$ cm (shown)	[B1] must show subtraction from radius
Q21(b)	Area of biggest circle $= 64\pi$ cm^2 Area of the shaded triangle $= 0.5 \times 4.5 \times (13.22)$ $= 29.745$ cm^2 Area of region between 2 concentric circles $= 16\pi$ cm^2 $- 4\pi$ cm^2 $= 12\pi$ cm^2 Area of the unshaded region $= 64\pi$ cm^2 $- 12\pi$ cm^2 $- 29.745$ cm^2 $= 52\pi - 29.745$ cm^2 Cost of shaded region with gold paint $= (12\pi + 29.745) \times \$2$ $= \$134.8882237$ Cost of unshaded region with silver paint $= (52\pi - 29.745) \times \$1.20$ $= \$160.3413816$ Total cost of the plaque $= \$134.8882237 + \$160.3413816$ $= \$295.23$	[M1 for area of biggest circle or triangle found] [M1] [M1 for unshaded region] [M1 Finding the cost of shaded or unshaded region or ECF 1] [A1 for addition of costs]

Q22(a)	$3\overrightarrow{AN} = 6\mathbf{b} - 6\mathbf{a}$ $\overrightarrow{AN} = 2\mathbf{b} - 2\mathbf{a}$ or $2(\mathbf{b}\text{-}\mathbf{a})$	[M1 for vector AB = 6b- 6a OR 1/3 of their = $\overrightarrow{AB}$ [A1]
Q22(b)	$\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$ $= 6\mathbf{a} + 2\mathbf{b} - 2\mathbf{a}$ $= 4\mathbf{a} + 2\mathbf{b}$ $=2(2\mathbf{a} + \mathbf{b})$	[B1]
Q22 (c)	$\overrightarrow{NM} = \overrightarrow{OM} - \overrightarrow{ON}$ $= 3\mathbf{b} - (4\mathbf{a} + 2\mathbf{b})$ $= \mathbf{b} - 4\mathbf{a}$ OR $\overrightarrow{NM} = \overrightarrow{NA} + \overrightarrow{AO} + \overrightarrow{OM}$ $= -2\mathbf{b} + 2\mathbf{a} - 6\mathbf{a} + 3\mathbf{b}$ $= \mathbf{b} - 4\mathbf{a}$	[M1 OR $\overrightarrow{NO} + \overrightarrow{OM}$] [A1 shown] [M1] [A1 shown]
Q22(d)(i)	$\overrightarrow{MP} = 3\overrightarrow{MN}$ $\overrightarrow{OP} - \overrightarrow{OM} = 3(-\mathbf{b} + 4\mathbf{a})$ $\overrightarrow{OP} - 3\mathbf{b} = -3\mathbf{b} + 12\mathbf{a}$ $\overrightarrow{OP} = 12\mathbf{a}$	[M1] [A1]
Q22(d) (ii)	$\overrightarrow{OP} = 12\mathbf{a}$ $\overrightarrow{OP} = 2(6\mathbf{a})$ $\overrightarrow{OP} = 2\overrightarrow{OA}$ 1. Since $\overrightarrow{OP} = 2\overrightarrow{OA}$, OP // OA. 2. A is the common point, O, A and P are collinear. 3. OP is twice the length of OA. 4. $\lvert OP\rvert = 2\lvert OA\rvert$	[B1 with working] [B1 with working] [B1] [B1 magnitude]