2005 NSW BOS General Mathematics Solutions

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Section I

1	2	3	4	5	6	7	8
B	**B**	**D**	**B**	**A**	**B**	**D**	**D**

9	10	11	12	13	14	15	16
C	**B**	**D**	**A**	**A**	**B**	**D**	**C**

17	18	19	20	21	22
A	**C**	**A**	**C**	**C**	**B**

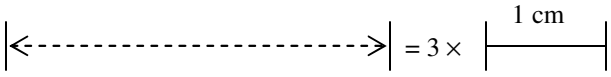
Q1 $\text{Mean} = (3+4+5+6+6+8+8+8+15) \div 9 = 7$

Q2 $\dfrac{a-b}{4} = \dfrac{240-56}{4} = 46$

Q3

Radio station	Probability of rain
2AT	0.53
2BW	17% = 0.17
2CZ	13/25 =0.52
2DL	0.6

Q4 By comparing:



Q5 The sine rule

Q6 Taxable income = 60000 – 5000 = 55000
Medicare levy = 1.5%*of* 55000 = 825

Q7 $2m^2 \times 3mp^2 = 2 \times 3m^{2+1}p^2 = 6m^3p^2$

Q8 $\theta = \tan^{-1} 85 = 89^o 19' 33.467'' \approx 89^o 20'$

Q9 $IQR = Q_U - Q_L = 80 - 45 = 35$

Q10 $\dfrac{9.56}{1000} \times 70000 = 669.20$

Q11 $\Pr(x > 4) = \dfrac{3}{6} = \dfrac{1}{2}$

Q12 $\text{Area} \approx \dfrac{40}{6}(19 + 4 \times 15 + 23) = 680$

Q13 Dividend yield $\dfrac{0.10}{2.50} \times 100\% = 4\%$

Q14 Line B should read $139 = 5t^3$

Q15 The annual depreciated amount is decreasing, graph D.

Q16 $\Pr(1 \mid male) = \dfrac{1372}{1372+2054} = \dfrac{1372}{3426}$

Q17 Increase by \$2 per student, $\therefore$ \$6

Q18 Area (small sail) $= \dfrac{1}{2} \times 3 \times 4 = 6$.

Area (large sail) $= \dfrac{1}{2} \times 9 \times 12 = 54$. Total area $= 6 + 54 = 60$.

Q19 A is 60^o west of B, $\therefore$ A is $\dfrac{60}{360} \times 24 = 4$ hours behind B.

Q20 Difference $= 10^5 - 10^4 = 90000$

Q21 $\dfrac{50}{n} = \dfrac{5}{200}$, $n = 2000$

Q22 For people under 21, 75th percentile $= Q_U = 350$

Section II

Q23ai Each ticket is equally likely to win first prize. If a person has more tickets, the chance of winning first prize is higher.

Q23aii $\Pr(K' \cup H') = \dfrac{45+10+14}{100} = 0.69$

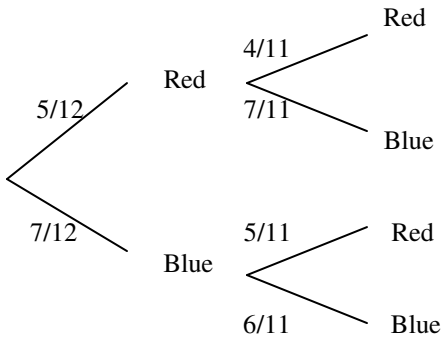
Q23bi $\text{Volume} = 21 \times 8 \times 9 = 1512 \text{ cm}^3$

Q23bii Volume removed for each hole $= \pi(1.4)^2 \times 8 = 49.26 \text{ cm}^3$
Volume remained $= 1512 - 3 \times 49.26 \approx 1364 \text{ cm}^3$

Q23biii % of clay removed $= \dfrac{3 \times 49.26}{1512} \times 100\% \approx 9.8\%$

Q23ci $\Pr(red) = \dfrac{5}{12}$

Q23cii



Q23ciii $\Pr(same.colour) = \dfrac{5}{12} \times \dfrac{4}{11} + \dfrac{7}{12} \times \dfrac{6}{11} = \dfrac{62}{132} = \dfrac{31}{66}$

Q24ai Arrange the scores in ascending order:
19 21 23 27 27 29 34 35 45 58

1	9
2	1 3 7 7 9
3	4 5
4	5
5	8

Q24aii $\text{Median} = \dfrac{27+29}{2} = 28$

Q24aiii Positively skewed.

Q24bi $D = \dfrac{2A}{15} = \dfrac{2\times 9}{15} = 1.2 \text{ mL}$

Q24bii Sam's age: $4 = \dfrac{2A}{15} = 30 \text{ months}$
$\text{Difference} = 30 - 9 = 21 \text{ months}$

Q24c $T = 2\pi L^2$, $L^2 = \dfrac{T}{2\pi}$, $L = \pm\sqrt{\dfrac{T}{2\pi}}$

Q24di Let N be the total number in Sumcity.
$15\% of N = 24000$, $0.15N = 24000$, $N = \dfrac{24000}{0.15} = 160000$

Q24dii Western Suburbs: $10\% of 160000 = 16000$

Q25ai $X = 4\% of 5000 = 0.04\times 5000 = 200$
$Y = 30\times 52 = 1560$, $Z = 48\times 12 = 576$

Q25aii Saving amount $= 4680 + 200 - 1560 - 624 - 576 = 2120$
Yes.

Q25bi $c^2 = 13^2 = 169$, $a^2 + b^2 = 5^2 + 12^2 = 169$,
$\therefore c^2 = a^2 + b^2$, $\therefore \angle C$ is a right angle and hence ΔABC is right-angled.

Q25bii $\angle ABC = \sin^{-1}\left(\dfrac{12}{13}\right) = 67^o$

Q25ci Expected number of times to win $\$4 = \dfrac{3}{5}\times 60 = 36$

Q25cii $E(winnings) = 4\times\dfrac{3}{5} + 0\times\dfrac{1}{5} + (-8)\times\dfrac{1}{5} = \$0.80$

Q25ciii No.
$E(winnings) = 4\times\dfrac{3}{6} + 0\times\dfrac{2}{6} + (-8)\times\dfrac{1}{6} = \$0.67$

Q26a
Dec 2005: 150000

Dec 2006: $150000(1-0.1) = 135000$

Dec 2007: $135000(0.9) = 121500$

Dec 2008: $121500(0.9) = 109350$, $\therefore$ 2008

Q26bi $\$4.3101\times 3600 = \$15516.36$

Q26bii $\text{Interest} = 15516.36 - 3600\times 4 = \$1116.36$

Q26ci z-score $= 0$

Q26cii $\text{Weight} = 754 - 2 = 752 \text{ grams}$

Q26ciii $750 = 754 - 2(2) = \mu - 2\sigma$, $\therefore 2.5\%$ will have a weight less than 750 grams.

Q26di $r = 0.06 \div 12 = 0.005$, $n = 12\times 9 = 108$,
$28000 = M\left\{\dfrac{1.005^{108} - 1}{0.005\times 1.005^{108}}\right\}$

Q26dii $M = \$336.16$

Q27ai $\text{Number of school shoes} = 18000 - 3000 = 15000$

Q27aii April

Q27aiii Sales figures of school shoes decline over the year. The highest volume occurs at the start of the year that corresponds to the start of a new school year in Australia.

Q27b $\text{Length of arc } AB = \dfrac{35+8}{360}\times 2\pi\times 6400 = 4803.1461 \text{ km}$
$= 2593.5 \text{ nautical miles}$

Q27ci $\theta = 360 - 250 = 110^o$

Q27cii The cosine rule:
$BC = \sqrt{36^2 + 15^2 - 2(36)(15)\cos 110^o} = 43 \text{ km}$

Q27di Use calculator $s_{n-1} = 1.69$

Q27dii Standard deviation is one of the statistics, which is used to measure the spread of a set of data. About 68% of the data are within $\pm$ one standard deviation from the mean.

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Q28ai The base is a composite figure that consists of a rectangle and 2 semicircles (i.e. a full circle):

$Area = x(2y) + \pi y^2 = 2xy + \pi y^2$

Q28aii

Perimeter of the base $= 2\pi y + 2x = 2\pi(2.5) + 2(6) = 5\pi + 12$ m

Total area of wall $= (5\pi + 12) \times 1.1 = 30.5\ \text{m}^2$

Total area of base $= 2(6)(2.5) + \pi(2.5)^2 = 49.6\ \text{m}^2$

Total area covered in tiles $= 30.5 + 49.6 \approx 80\ \text{m}^2$

Q28aiii Volume of water saved $= 6 \times 3 \times 5 \times 365 = 32850$ L

$= 32.85$ kL. Money saved $= 1.013 \times 32.85 = \$33.28$

Q28bi $\$C = 400 + 300 + 12x$, $\$C = 700 + 12x$

Q28bii Approximately 88 (estimated from graph).

Q28biii Profit = income − costs

$= 20 \times 150 - (700 + 12 \times 150) = \$500$

Q28biv Profit = income − costs. Let p be the price of a ticket.

$\therefore 1500 = p \times 200 - (700 + 12 \times 200)$

$p = \$23$

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