

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

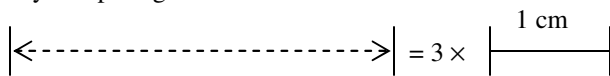
Q1 Mean = $(3 + 4 + 5 + 6 + 6 + 8 + 8 + 8 + 15) \div 9 = 7$

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

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

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

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

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

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

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

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

Q15 The annual depreciated amount is decreasing, graph D.

Q16 $\Pr(11 \text{ male}) = \frac{1372}{1372 + 2054} = \frac{1372}{3426}$

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

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

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

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

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

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

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

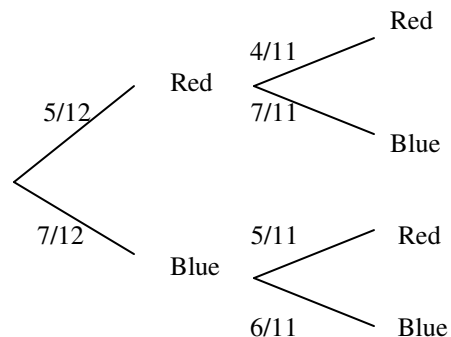
Q23bi Volume = $21 \times 8 \times 9 = 1512 \text{ cm}^3$

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 = $\frac{3 \times 49.26}{1512} \times 100\% \approx 9.8\%$

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

Q23cii Moheb's tie Brother's tie



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

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 Median = $\frac{27 + 29}{2} = 28$

Q24aiii Positively skewed.

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

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

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

Q24di Let N be the total number in Sumcity.

$15\% \text{ of } N = 24000, 0.15N = 24000, N = \frac{24000}{0.15} = 160000$

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

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

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 $\triangle ABC$ is right-angled.

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

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

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

Q25ciii No.

$E(\text{winnings}) = 4 \times \frac{3}{6} + 0 \times \frac{2}{6} + (-8) \times \frac{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 Interest = $15516.36 - 3600 \times 4 = \1116.36

Q26ci z-score = 0

Q26cii 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 $r = 0.06 \div 12 = 0.005, n = 12 \times 9 = 108,$

$28000 = M \left\{ \frac{1.005^{108} - 1}{0.005 \times 1.005^{108}} \right\}$

Q26dii $M = \$336.16$

Q27ai 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 Length of arc $AB = \frac{35 + 8}{360} \times 2\pi \times 6400 = 4803.1461 \text{ km}$
 $= 2593.5 \text{ nautical miles}$

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

Q27cii The cosine rule:

$BC = \sqrt{36^2 + 15^2 - 2(36)(15)\cos 110^\circ} = 43 \text{ km}$

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.

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

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

Q28aii

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

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

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

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

Q28aiii Volume of water saved = $6 \times 3 \times 5 \times 365 = 32850 \text{ L}$
= 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.
 $\therefore 1500 = p \times 200 - (700 + 12 \times 200)$
 $p = \$23$

Please inform mathline@itute.com re conceptual, mathematical and/or typing errors.