2010 NSW BOS General Mathematics Solutions

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Section I

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

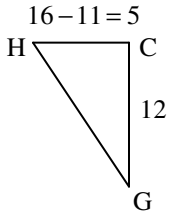
9	10	11	12	13	14	15	16
C	**D**	**D**	**C**	**B**	**A**	**A**	**B**

17	18	19	20	21	22	-	-
B	**B**	**A**	**D**	**B**	**D**	-	-

Q1 Range $= 9 - 0 = 9$ C

Q2 $(1 + 0.10)x = 725$, $x = 659.09$ D

Q3



$\overline{GH} = \sqrt{5^2 + 12^2} = 13$ B

Q4 A

Q5 $I = 2000 \times 0.06 \times \frac{17}{12} = 170$

Total value $= 2000 + 170 = 2170$ A

Q6 D

Q7 $\frac{3M^2 + 5M}{6} = \frac{3(-9)^2 + 5(-9)}{6} = 33$ C

Q8 $\Pr(yellow) = 1 - \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{6}\right) = \frac{1}{4}$

$\frac{1}{4}n = 12$, $n = 48$ C

Q9 $\angle PRQ = 180 - (26 + 46) = 108°$

$\frac{\overline{PQ}}{\sin 108°} = \frac{76}{\sin 26°}$, $PQ \approx 165$ C

Q10 Bearing of A from B $= 360 - 30 = 330$ D

Q11 D

Q12 $\Pr(accurate) = \frac{72 + 256}{347} = \frac{328}{347} \approx 0.95$ C

Q13 $time = \frac{k}{temp}$, $8 = \frac{k}{30}$, $k = 240$,

$\therefore time = \frac{240}{temp} = \frac{240}{12} = 20$ B

Q14 Select 3 out of 5:

Number of different combinations $= {}^5C_3 = 10$ A

Q15 A

Q16 The median lies between the 13th and 14th test results, i.e. 45 and 47. .: the median $= \frac{45 + 47}{2} = 46$ B

Q17 Volume of water $= 1.5 \times 10000 \times 0.17 = 2550\ \text{m}^3$
$= 2550$ kL B

Q18 B

Q19 Area $= \frac{1}{2} \times \pi \times 8 \times 7 - 5 \times 2 \approx 78$ A

Q20 $\Pr(only\,1\,success) = 0.7 \times 0.4 + 0.3 \times 0.6 = 0.46$ D

Q21 B

Q22 Number of days from 29 June to 23 July = 25

$I = 1721.50 \times \frac{0.0521}{100} \times 25 \approx 22.42$

Closing balance $= 1721.50 + 22.42 = 1743.92$

Minimum payment due = 5% of closing balance
$= 0.05 \times 1743.92 \approx 87.20$ D

Section II

Q23a Maximum weekly $= 1586.70 \times 1.035$

A year has $\frac{365.242}{7}$ weeks.

. : maximum per annum $= 1586.70 \times 1.035 \times \frac{365.242}{7} \approx \$85688$

Q23bi shower

Q23bii 5000

Q23biii Area of the floor (m^2) $= 5 \times 10 - 2 \times 2 = 46$

Q23ci Number of people $= 5 + 15 + 10 + 3 + 1 = 34$

Q23cii $\Pr(blue\ or\ green) = \frac{5 + 10}{34} = \frac{15}{34}$

Q23di

$X = 590 - (175 + 45 + 10 + 15 + 90 + 40 + 30 + 70 + 50 + 40)$

$= \$25$

Q23dii $(40 + 40) \times 3 = \$240$

Q23diii Two weeks before the due date he is short of

$620 - 240 = \$380$

Entertainment, clothes and gifts are also non essential. In the two weeks before the due date, he could put aside savings, entertainment, clothes and gifts as well as his telephone and internet money to pay the bill:

$(40 + 70 + 50 + 40) \times 2 = \$400$ which is more than enough to cover the \$380 shortfall.

Q24ai $4y + 8 - 3y - 3 = -3$

Q24aii $y + 5 = -3$, $y = -8$

Q24b $x = 4$

When $x = 4$ income *I* equals cost *C*, .: break even.

Q24ci $z = \dfrac{115 - 100}{10} = 1.5$

Q24cii 100

Q24ciii 80 is 2 standard deviations below 100, and 110 is 1 standard deviation above 100.

% of marks lie between 80 and 110 $= \dfrac{95}{2}\% + \dfrac{68}{2}\% = 81.5\%$

Q24di Angle of depression $= \tan^{-1}\left(\dfrac{168}{126}\right) \approx 53°8'$

Q24dii $\tan 28° = \dfrac{168}{\overline{AC}}$, $\overline{AC} = \dfrac{168}{\tan 28°} \approx 316$

$\overline{CB} = 316 - 126 = 190\text{ m}$

Q25ai and ii Scatterplot was not shown in the question booklet.

Q25b Monthly repayment = 670.49 from the given spreadsheet.

Interest $= 670.49 \times 48 - 28000 = \$4183.52$

Q25ci $15° - 1° = 14°$ from Port Ary to Nauru.

Time taken $\dfrac{60 \times 14}{15} = 56$ hours

Q25cii Sydney is $151° + 149° = 300°$ east of Papeete.

.: Papeete is $\dfrac{300}{360} \times 24 = 20$ hours behind Sydney.

7 pm on Friday in Sydney is 11 am on Thursday in Papeete.

Q25d Interest rate 6% per annum $= \dfrac{1}{12} \times 6\% = 0.5\%$ per month.

After the 36th deposit of \$150, the balance

$= 600(1 + 0.005)^{36} + 150 + 150(1 + 0.005) + 150(1 + 0.005)^2 + ...$

$... + 150(1 + 0.005)^{35}$

$= 600 \times 1.005^{36} + \dfrac{150(1.005^{36} - 1)}{0.005}$

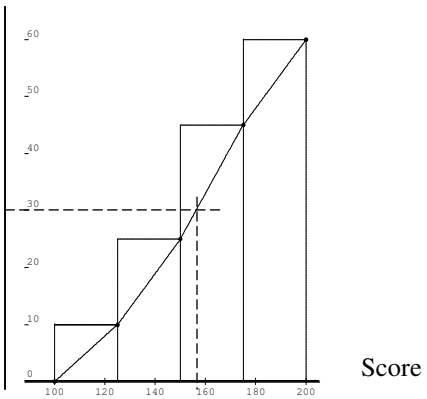
$= \$6618.42$, .: not enough.

Q26ai $10 \times 10 \times 26 \times 26 \times 10 \times 10 = 6760000$

Q26aii $\dfrac{2}{10 \times 10 \times 10 \times 10} = \dfrac{1}{5000}$

Q26bi $X = 25 - 10 = 15$

Q26bii



Q26biii 157

Q26biv There is an increase chance of accident occurring at the end of a school day. Reducing the speed limit helps to prevent accident caused by speeding, and it can also discourage some motorists from using the road.

Q26c

Win/loss	10	3	$^{-}8$
Chance	0.2	0.5	0.3

$E(win/loss) = 10 \times 0.2 + 3 \times 0.5 + {}^{-}8 \times 0.3 = \$1.10$

Financial expectation $1.10 - 2.00 = -\$0.90$

Q26d $s = \dfrac{1}{2}(83 + 50 + 40) = 86.5$

Area $= \sqrt{86.5(86.5 - 83)(86.5 - 50)(86.5 - 40)} \approx 717\text{ m}^2$

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Q27a $\frac{4x^2}{3y} \div \frac{xy}{5} = \frac{4x^2}{3y} \times \frac{5}{xy} = \frac{4x}{3y} \times \frac{5}{y} = \frac{20x}{3y^2}$

Q27bi $\frac{1750}{2} = 875$

Q27bii $875 \times 4 = 3500$

Q27biii The median age has decreased in 2010. The distribution of age changes from negatively skewed in 2000 to positively skewed in 2010.

Q27biv Government planning must include childcare and primary education expansion in the short term.

Q27ci \$3000 (Read from graph)

Q27cii Gradient $= \frac{9-3}{39-21} = \frac{6}{18} = \frac{1}{3}$

Q27ciii $\frac{1}{3} = \$0.33$

Q27civ $T = \frac{1}{3}I + c$, use $(21000,3000)$ to find c

$3000 = \frac{1}{3} \times 21000 + c$, $c = -4000$

$\therefore T = \frac{1}{3}I - 4000$

Q28ai $1573 - 1588 = -15$, i.e. a decrease of \$15

Q28aii 30% of \$6500 = \$1950
Loan = \$307000 = \$300000 + \$7000
Monthly repayment = \$1942 + 7×\$6.47 = \$1987.29
Monthly repayment is greater than 30% of monthly gross salary.
Bank would not have approved the loan.

Q28aiii The graph of Xiang's loan balance is smooth and the graph of Jack's is not. Xiang's loan has a constant rate and repayment. Jack's loan has a change in rate (or repayment) after 12 years.

The term of Xiang's loan is shorter than that of Jack's. Jack has a higher repayment (or lower rate) in the first 12 years but a much lower repayment (or much higher rate) after the first 12 years.

Q28bi $3 \times 4 \times 6 = 72$

Q28bii Area of each label $= \pi \times diameter \times height = \pi \times 10 \times 9$
Total area of paper needed $= \pi \times 10 \times 9 \times 72 \approx 20357.52 \text{ cm}^2$

Q28iii $V = \pi r^2 h = \pi \left(\frac{d}{2}\right)^2 h$

Original can, $d = 10$, $h = 10$, $V = \pi \left(\frac{10}{2}\right)^2 10 = 250\pi \text{ cm}^3$

Larger can, $d = 20$, $h = 10$, $V = \pi \left(\frac{20}{2}\right)^2 10 = 1000\pi \text{ cm}^3$

Monica is not correct, the volume is quadrupled.

Q28c From the left graph, the least surface area occurs when $r = 6$ cm.
$V = \pi r^2 h$, $1570 = \pi \times 6^2 \times h$, $h \approx 13.9$ cm

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

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