2016 NSW BOS Mathematics General 2 Solutions

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Section I

1	2	3	4	5	6	7	8	9
B	D	B	B	C	D	A	B	D

10	11	12	13	14	15	16	17	18
A	C	D	A	A	D	A	B	C

19	20	21	22	23	24	25		
A	C	D	C	C	B	D		

Q1 $208.345 \approx 2.1\times10^2 = 210$ B

Q2 $2(5) = 10$ D

Q3 B

Q4 B

Q5 $2(3x-4)+2 = 6x-8+2 = 6x-6$ C

Q6 $6\times4\times2 = 48$ D

Q7 A

Q8 $\frac{2500}{1000}\times1124.86 = 2812.15$ B

Q9 $(130-50)\times2\times52 = 8320$ D

Q10 $BAC_{\text{female}} = \frac{10N-7.5H}{5.5M} = \frac{10\times2.3\times2-7.5\times3}{5.5\times53} \approx 0.081$ A

Q11 $\text{Concentration} = \frac{100}{5} = 20$ mg/mL, $2000\div20 = 100$ mL C

Q12 $\text{Volume} = 12\times1000 = 12000$ cm^3, $h = 12000\div240 = 50$ cm D

Q13 40 is 2 standard deviation greater than the mean, .: 2.5% A

Q14 A

Q15 $\frac{2\times60+15}{30} = 4.5$.: will be charged for 5 periods
$\$0.54\times5 = \$2.70$ D

Q16 $\frac{W}{20.3} = \frac{7.1}{8.1}$, $W \approx 17.8$ m A

Q17 $780\times\left(1+\frac{0.036}{100}\right)^{24} - 780 \approx 6.77$ B

Q18 $E = kS^2$, $k = \frac{E}{S^2} = \frac{20}{10^2} = 0.2$
When $S = 40$, $E = 0.2\times40^2 = 320$ C

Q19 A

Q20 $18\times35+18\times1.5x = 1008$, $x = 14$, total $= 35+14 = 49$ C

Q21 $\frac{3\times3+8\times6+13\times8+18\times9}{3+6+8+9} \approx 12.4$ D

Q22 History: $\frac{1}{4}\times112 = 28$ Geography: $\frac{1}{2}n = 28$, $n = 56$ C

Q23 $156+264-88 = 332$, $\Pr(S\cup M) = \frac{332}{485} \approx 0.68 = 68\%$ C

Q24 $iR+\frac{Q}{C} = e$, $\frac{Q}{C} = e-iR$, $Q = Ce-CiR$ B

Q25 $\angle NBC = \angle BCA + 25°$. Since $\angle BCA > 90°$, .: $\angle NBC > 115°$ D

Section II

Q26a Area $= 4\pi\times5^2 \approx 314$ cm^2

Q26b $\frac{8x^4y}{24x^3y^5} = \frac{x}{3y^4}$

Q26c Amount of fuel $= \frac{5.9}{100}\times170+\frac{7.3}{100}\times25 = 11.855 \approx 12$ L

Q26d Length of $AB = \sqrt{32^2+33^2} \approx 46$ m

Q26e Total $= \frac{4}{52}\times\$63752\times\left(1+\frac{17.5}{100}\right) = \$5762.20$

Q26fi $\$82521+\$10920-\$13420 = \$80021$

Q26fii $\$17547+\$0.37\times21 = \$17554.77$

Q26fiii Tax + levy $= \$17554.77+\$1600.42 = \$19155.19$
Tax refund $= \$20525-\$19155.19 = \$1369.81$

Q27a Compulsory third-party insurance: This insurance provides compensation for people injured or killed when your vehicle is involved in an accident.
Non-compulsory third-party property insurance: This insurance covers damage to other people's property and legal costs, but not damage to your own vehicle

Q27b
Three possible samples of 1 student: Mean heights are 153, 168, 174
Three possible samples of 2 students: Mean heights are
$\frac{153+168}{2} = 160.5$, $\frac{168+174}{2} = 171$, $\frac{174+153}{2} = 163.5$
One possible sample of 3 students: Mean height is
$\frac{153+168+174}{3} = 165$
The mean of all the possible means
$= \frac{153+168+174+160.5+171+163.5+165}{7} = 165$ cm

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Q27ci $Q_1 = 136$, $Q_3 = 172$, $\text{IQR} = 172 - 136 = 36$ cm

Q27di $A = \$19000$, $B = 17915.67 + 71.66 - 436.00 = \$17551.33$

Q27dii $X = 436.00 + 18278.56 - 18640.00 = \$74.56$

Q27diii $\$436.00 \times 4 \times 12 = \$20928.00$

Q27ei Difference $= 145 - 55 = 90°$

Q27eii Time difference $= 24 \times \dfrac{90}{360} = 6$ hours

Q27eiii
Departure: Dubai time $= 23:30 - 6:00 = 17:30$ Friday
Arrival:
Dubai time $= 17:30 + 15:00 - 24:00 = 8:30$ Saturday morning

Q28ai $\dfrac{4}{33+4} = \dfrac{4}{37}$

Q28aii $\dfrac{20}{n} = \dfrac{4}{37}$, $n = \dfrac{20 \times 37}{4} = 185$ coins

Q28b Total $= 990 + 0.35 \times 505 \times 5 = \$1873.75$

Q28ci $\Pr(WD \text{ or } DW) = 0.7 \times 0.2 + 0.2 \times 0.7 = 0.28$

Q28cii Probability cannot be greater than 1.

Q28d Number of periods (quarters) $= 4 \times 6 = 24$
Interest rate per period $= 3\% \div 4 = 0.75\%$
For each dollar of future value, quarterly contribution $= \$0.0382$
Required quarterly contribution $= \$0.0382 \times 75000 = \$2865$

Q28ei Volume $= \pi \times 2.5^2 \times 3 \approx 58.9$ cm^3

Q28eii For each gap, shading area $= 5^2 - \pi \times 2.5^2 \approx 5.3650$
Volume of each gap $= 5.3650 \times 6 \approx 32.19028$
Total volume $= 32.19028 \times 6 \approx 193$ cm^3

Q29ai $\Pr(HT \text{ or } TH) = \dfrac{1}{2} \times \dfrac{1}{2} + \dfrac{1}{2} \times \dfrac{1}{2} = \dfrac{1}{2}$

Q9aii $\text{E}(win) = 40 \times \dfrac{1}{4} + 20 \times \dfrac{1}{4} + {}^{-}30 \times \dfrac{1}{2} = 0$

Q29bi At age $x = 0$, $M = A = 1.5$ kg

Q29bii Daily growth rate $= 0.1 = 10\%$

Q29c Yes, Pat is correct.
Women: Median is 55, negatively skewed
Men: Median is 45, positively skewed

Q29di $r \approx 0.907$

Q29dii
$$\text{gradient} = r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}} = 0.907 \times \frac{13.73}{9.05} \approx 1.376$$
$$y\text{-intercept} = \bar{y} - (\text{gradient} \times \bar{x}) = 66 - 1.376 \times 69.4 \approx -29.497$$
Equation: $y = 1.376x - 29.497$

Q29ei 68 years

Q29eii $\text{gradient} = \dfrac{20}{80} = 0.25$
Interpretation: The life expectancy increases by 0.25 years every year.

Q30a Volume $= 30 \times 10000 \times 2 = 600000$ cm^3 $= 600$ Litres

Q30bi Remaining:
$6.44 - 3.44 = 3.00$ GB $= 3.00 \times 1024$ MB $= 3072$ MB

Q30bii $\text{Speed} = \dfrac{8 \times 3072 \times 2^{20} \text{ Mb}}{(7 \times 60 \text{ s}) \times 10^6} \approx 61$ Mbps

Q30c Length of $AB = 2 \times 45 \sin 50° \approx 68.944$ m
Height of $\Delta = 45 \cos 50° \approx 28.925$ m
Area of $\Delta = \dfrac{1}{2} \times 68.944 \times 28.925 \approx 997.12$ m^2
Area of rectangle $= 20 \times 68.944 \approx 1378.88$ m^2
Area of major sector $= \pi \times 45^2 \times \dfrac{260}{360} \approx 4594.58$ m^2
Total $\approx 997.12 + 1378.88 + 4594.58 \approx 6971$ m^2

Q30di $\bar{x} = 88 - 2.4s$ …… (1)

Q30dii $\bar{x} = 52 + 1.2s$ …… (2)
(1) add to $2 \times (2)$: $3\bar{x} = 192$, $\bar{x} = 64$ …… (3)
Substitute (3) in (2): $64 = 52 + 1.2s$, $s = 10$

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

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