NSW BOS General Mathematics Solutions 2007

Free download and print from www.itute.com
Do not photocopy © Copyright 2007 itute.com

Section I

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

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

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

Q1 B

Q2 A

Q3 $280\times 4\times(1+0.175)=1316$ D

Q4 A

Q5 C

Q6 Let \$$x$ be the price excluding GST.
$(1+0.10)x=22$, $x=20$, GST $=22-20=\$2.00$ A

Q7 The weekly savings is **less than** $\frac{1}{4}\times 900=225$.
Number of weeks required is **more than** $\frac{3600}{225}=16$ D

Q8 $\frac{12}{h}=\sin 50°$, $h=\frac{12}{\sin 50°}=15.66\text{ cm}$ C

Q9 A

Q10 $\frac{2}{7}\times\frac{2}{7}=\frac{4}{49}$ B

Q11 Arc length $=r\theta=3\times\frac{60}{360}\times 2\pi=\pi=3.14\text{ cm}$ B

Q12 C

Q13 $5\times 4\times 3=60$ C

Q14 $3x^2(x+8)+x^2=3x^3+24x^2+x^2=3x^3+25x^2$ B

Q15 $p\propto\frac{1}{V}$, $p=\frac{k}{V}$ A

Q16 D

Q17 Same number in each year group: $10\%\times 1200\div 6=20$.
Stratified sample based on year groups:
For year 10, $10\%\times 230=23$; for year 11, $10\%\times 150=15$.
C

Q18 Arithmetic sequence: $a=6$, $d=4$, $t_n=486$.
$486=6+(n-1)4$, $n=121$. C

Q19 $B=2\pi\left(R+\frac{T}{2}\right)$, $\frac{T}{2}=\frac{B}{2\pi}-R$, $T=\frac{B}{\pi}-2R$. A

Q20 Difference in time $=\frac{115+80}{360}\times 24=13\text{ hours}$.
Perth time = 10.00 pm Wed + 13 hours = 11.00 am Thur. D

Q21 $25-5=2x-6$, $2x=26$, $x=13$.
Median = 13, interquartile range $=18-6=12$. D

Q22 In the 4th decile means between 30% and 40% of the cumulative frequency, i.e. between 15 and 20 of the cumulative frequency out of 50. This corresponds to exam marks between 55 and 60. B

Section II

Q23ai \$5000.

Q23aii Rose's. \$2000.

Q23aiii 1 year.

Q23bi Radius of hole $=3.78+1=4.78\text{ m}$.
Volume of soil removed $=\pi r^2 h=\pi(4.78)^2(2)\approx 144\text{ m}^3$.

Q23bii Number of hours $=\frac{90000}{7500}=12$.

Q23biii Volume of water collected $=400\times 0.020=8\text{ m}^3$.
Number of litres $=8\times 1000=8000$ litres.

Q23ci Total captured in second stage $=\frac{18}{0.4}=45$.

Q23cii Total population estimate $\approx\frac{24}{0.4}=60$.

Q24ai Mean $=\frac{3+5+5+6+8+8+9+10+10+50}{10}=11.4$.

Q24aii The mean decreases and the median remains the same.

Q24b $D=\frac{t}{3}$, $t=3D=3\times 1.2=3.6$.

Q24ci $US\$150 = 5 \times US\$30 = 5 \times A\$40 = A\$200$
$A\$800 = 8 \times A\$100 = 8 \times €60 = €480$.

Q24cii If the value of the euro falls, A\$100 can buy more than €60. $\therefore$ the gradient increases.

Q24di Male students attending tend to be younger than female students.

Q24dii 64

Q24diii 30-39 age group: class centre = 34.5, frequency = 5.
$34.5 \times 5 = 172.5$

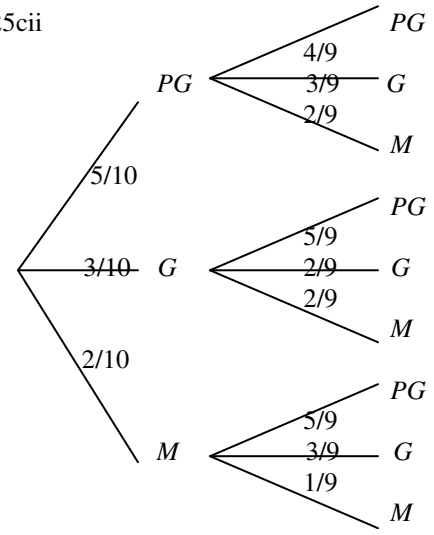
Q24div The mean calculated from the grouped frequency distribution table is an estimation whilst the mean calculated from the original data is exact.

Q25a A marble is drawn at random from a bag containing 3 red and 1 blue marbles.
The probability that a red marble is drawn is $\frac{3}{4}$.

Q25b $\angle MJK = 90 - 75 = 15°$.
The sine rule: $\frac{20}{\sin \angle JMK} = \frac{18}{\sin 15°}$, $\sin \angle JMK = \frac{20 \sin 15°}{18}$,
$\angle JMK = 16.7129°$.
$\angle KML = 75 - 16.7129 \approx 58°$ is the angle of elevation from M to K.

Q25ci $\Pr(M) = \frac{2}{10} = \frac{1}{5}$.

Q25cii



Q25ciii $\Pr(samerating) = \frac{5}{10} \times \frac{4}{9} + \frac{3}{10} \times \frac{2}{9} + \frac{2}{10} \times \frac{1}{9} = \frac{14}{45}$.

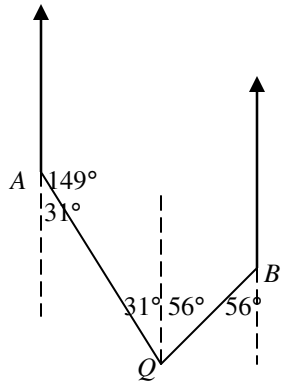
Q25di $Z_1 = \frac{63 - 60}{6.2} \approx 0.484$, $Z_2 = \frac{62 - 58}{6.0} \approx 0.667$. No, do not agree.

Q25dii $\Pr(X < 64) = 0.8413$, expected number $= 150 \times 0.8413 \approx 126$.

Q26ai 2 hours 48 min = 2.8 hours. Speed $= \frac{15}{2.8} \approx 5$ km/h.

Q26aii The cosine rule:
$AB = \sqrt{15^2 + 10^2 - 2(15)(10)\cos 87°} \approx 18$ km.

Q26aiii



Bearing of Q from B: S56°W or 236°T.

Q26bi Depreciation $= 5000 - 3635 = \$1365$
% depreciation per year $= \frac{1365 \times 100\%}{5000 \times 3} = 9.1\%$.

Q26bii Taxable income $= 800 \times 52 - \frac{1365}{3} = \$41145$.

Q26biii
Tax payable $= 4500 + (41145 - 28000) \times 0.30 = \$8443.50$.

Q26c Value $= 100(1.06)^{21} + 100(1.06)^{20} + ... + 100(1.06) + 100$
$= 100(1.06^{21} + 1.06^{20} + ... + 1.06 + 1)$
$= 100\left(\frac{1.06^{22} - 1}{1.06 - 1}\right) = \$100\left(\frac{1.06^{22} - 1}{0.06}\right)$.
Total interest $= 100\left(\frac{1.06^{22} - 1}{0.06}\right) - 100 \times 22 = \$2139.23$.

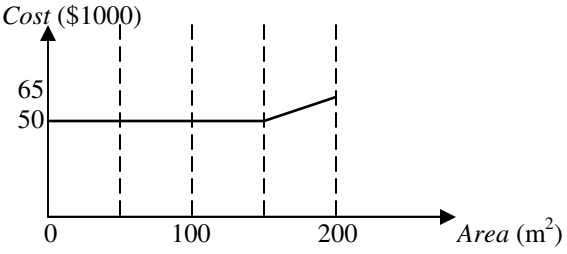
Q27ai Length $l = 10$ m, width $w = l - 6 = 4$ m.

Q27aii Area $A = l(l - 6)$.

Q27aiii Width $w \le 0$, impossible for a rectangle.

Q27aiv $l(l - 6) = 135$, $l^2 - 6l - 135 = 0$, $(l - 15)(l + 9) = 0$.
Since $l > 6$, $\therefore l = 15$ m and $w = l - 6 = 9$ m.

Q27av



© Copyright 2007 itute.com

Q27avi Company B: $360\times135=\$48600$, $\therefore$ Company B would charge less than Company A.

Q27bi Total purchase price $=6.00\times4=\$24$.
Total annual running cost $=4\times5\times365\times d=\$7300d$.
$\therefore \$c=\$(24+7300d)$.

Q27bii $\$(24+7300d)=\$250$, $7300d=226$, $d\approx0.031$.

Q27biii No.
Total annual running cost $=4\times10\times365\times d=\$14600d$.
$\therefore \$c=\$(24+14600d)=\$(24+14600\times0.031)=\$476$. It is less than $2\times250=\$500$.

Q27biv 97.5% will last up to $\mu+2\sigma=5000$ hours.
$\mu+2\times170=5000$, $\mu=4660$ hours.

Q28ai $\Pr(1)=\dfrac{10}{36}=\dfrac{5}{18}$.

Q28aii

Difference	Result	Probability
0	Win \$3.50	$\dfrac{6}{36}=\dfrac{1}{6}$
1	Lose \$5	$\dfrac{5}{18}$
2, 3, 4 or 5	Win \$2.80	$1-\dfrac{1}{6}-\dfrac{5}{18}=\dfrac{5}{9}$

$$\text{Expectation}=3.50\times\frac{1}{6}-5\times\frac{5}{18}+2.80\times\frac{5}{9}=\$0.75.$$

Q28aiii He expects to lose $1-0.75=\$0.25$ for each game.

Q28b $H^2=2^2+2^2=8$.
Area of right-angled triangle $=\dfrac{1}{2}\times2\times2=2$.
Area of regular hexagon $=2.598H^2=2.598\times8=20.784$.
Total area $=2+20.784=22.784\,\text{cm}^2$.

Q28ci
$$A\approx\frac{3.6}{3}(5+4\times4.6+3.7)+\frac{3.6}{3}(3.7+4\times2.8+0)=50.4\,\text{cm}^2.$$

Q28cii Curved surface area
$\approx7480.8-2\times50.4-5\times200-14.4\times200=3500\,\text{cm}^2$.

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

© Copyright 2007 itute.com