2017 NSW ESA Mathematics General 2 Solutions

© itute 2017

Section I

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

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

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

Q1 C

Q2 $95\times 2.5 = 237.5$ D

Q3 A

Q4 C

Q5 $\frac{180}{200}\times 75\,000 = 67\,500$ B

Q6 $1025\times 2 + 87.50\times 5 = 2487.50$ D

Q7 $I = \frac{3}{2}\times 26.55\times 3.07^2 \approx 375.35$ A

Q8 $\tan\theta = \frac{5.3}{1.9}$, $\theta = \tan^{-1}\left(\frac{5.3}{1.9}\right) \approx 70°17'$ B

Q9 $x = 5 - 6\times 3 = -13$ A

Q10 D

Q11 $\frac{19\,900 - 16\,300}{19\,900} \approx 0.18 = 18\%$ A

Q12 C

Q13 $z = \frac{154 - 165}{5.5} = -2$ A

Q14 $\frac{9 - 3.5}{100}\times 8000 = 440$ B

Q15 $\frac{5}{20} = \frac{1}{4}$ A

Q16 $3292\times\frac{75}{100}\times 6 = 14\,814$ D

Q17 $x + 3 = 6 - 2x$, $x = 1$, $y = 4$ B

Q18 $\frac{1}{2}(3.6 + 2.4)\times 1.2\times 1.5 = 5.4$ A

Q19 $20 = \frac{40y}{y + 12}$, $y = 12$ D

Q20 $4n + 1 \le 100$, $n = 24$ B

Q21 C

Q22 $\pi\left(0.45^2 - 0.35^2\right)\times 2.8 \approx 0.70$ C

Q23 $8\times 2\times 2^{40} = 2^{44}$ D

Q24 $\frac{12}{52}\times\frac{40}{51} + \frac{40}{52}\times\frac{12}{51} \approx 0.3620$ D

Q25 $\pi r^2 = 400$, $r \approx 11.284$, $\ell = \frac{1}{4}\times 2\pi r \approx 17.7$ C

Section II

Q26a $20\times\$0.27 = \$5.40$

Q26b $\$20 + 8\times\$0.70 + 3\times\$0.50 = \$27.10$

Q26c Let n be the number of goats on the property.

$\frac{80}{n} \approx \frac{16}{45}$, $n \approx 225$

Q26d $15\,000\sin 2° \approx 523$ mm

Q26e Brokerage fees = 1.5% of $500\times\$3.20 = \$24.00$

Profit $= 500(\$4.80 + \$0.26 - \$3.20) - \$24.00 = \$906.00$

Q26fi 4

Q26fii 3

Q26g Loan amount $= \$7990 - \$500 = \$7490$

Interest = $2\times 7\%$ of $\$7490 = \$1048.60$

Total to be repaid $= \$7490 + \$1048.60 = \$8538.60$

Weekly repayment $= \frac{\$8538.60}{2\times\frac{365}{7}} \approx \$81.88$

Note: If 52 weeks in a year is used, then weekly repayment

$= \frac{\$8538.60}{2\times 52} \approx \$82.10$

Q27ai 200.875

Q27aii 136.2

Q27b $\frac{3\times 1024\times 1024}{20} \approx 157286$ files

Q27ci $5.4163\times\$12\,000 \approx \$64\,995.60$

Q27cii $\$64\,995.60 - 5\times\$12\,000 = \$4995.60$

Q27di 25° W

Q27dii 8 am

Q27diii Arc $AB = \frac{30}{360} \times 2\pi \times 6400 \approx 3351$ km

Time taken $= \frac{3351}{40} \approx 84$ hours $= 3$ days 12 hours

Q27e $BAC_{\text{male}} = \frac{10N - 7.5H}{6.8M}$, $0.05 = \frac{10N - 7.5(5)}{6.8(90)}$ $\therefore N = 6.81$

$\therefore$ number of complete bottles $\leq \frac{6.81}{0.8} \approx 8.51$, i.e. 8 bottles

Q28ai $F = \frac{9(-20)}{5} + 32 = -4$ degrees Fahrenheit

Q28aii $C = \frac{9C}{5} + 32$, $C - \frac{9C}{5} = 32$, $-\frac{4C}{5} = 32$

$\therefore C = -40$ and $F = C = -40$

Q28aiii The result represents the intersection of the two graphs. Only at this intersection do the two temperature scales have the same numerical value.

Q28bi ${}^5C_2 = 10$

Q28bii $\Pr(\text{Mary}) = \frac{{}^4C_1}{10} = 0.4$

Q28c Amount outstanding after the first payment
$= \$100\,000 \times (1 + 0.01) - 1029 = \$99\,971$
Amount outstanding after the second payment
$= \$99\,971 \times (1 + 0.01) - 1029 = \$99\,941.71$

Q28d $x = \sqrt{yp - 1}$, $x^2 = yp - 1$, $yp = x^2 + 1$, $y = \frac{x^2 + 1}{p}$

Q28ei $\$8 + \$6 = \$14$

Q28eii $200 - 6 \times 10 = 140$ tickets

Q28eiii Total cost $= \$500 + 140 \times \$2 = \$780$
Profit = income − cost $= \$1960 - \$780 = \$1180$

Q29ai $h = \frac{200}{4} = 50$

$V \approx \frac{50}{3}(0 + 4(140) + 270) + \frac{50}{3}(270 + 4(300) + 360) \approx 44\,333\,\text{m}^3$

Q9aii $\frac{44\,333\,\text{m}^3}{2 \times (1000\,\text{m})^2} \approx 0.022\,\text{m} = 22\,\text{mm}$

Q29b
Tax payable $= \$3572 + (86\,725 - 37\,000) \times \$0.325 = \$19\,732.625$
Levy = 2% of \$86 725 = \$1734.50
Net income $= \$86\,725 - \$19\,732.625 - \$1734.50 = \$65\,257.875$
i.e. \$65 257.90

Q29ci Total number of students $= 150 + 2500 + 70 + 800 = 3520$
$\Pr(\text{city} \cap S') = \frac{2500}{3520} \approx 0.710$

Q29cii $\Pr(S \mid \text{city}) = \frac{150}{150 + 2500} \approx 0.057$
$\Pr(S \mid \text{country}) = \frac{70}{70 + 800} \approx 0.080$ $\therefore$ true

Q29di Median test mark $= \frac{4 + 8}{2} = 6$

Q29dii $5.4 - 4.22 = 1.18$, $5.4 + 4.22 = 9.62$
Percentage $= \frac{13}{30} \approx 43.3\%$

Q29diii According to the dot plot, only about 43% lie within one standard deviation of the mean, not 68% as in a normal distribution, $\therefore$ not relevant in this context.

Q30a $Q_L - 1.5 \times IQR = 10 - 1.5 \times (16 - 10) = 1$
$Q_U + 1.5 \times IQR = 16 + 1.5 \times (16 - 10) = 25$
Maximum range $= 25 - 1 = 24$

Q30b $\frac{C}{12^3} = \frac{\$50}{10^3}$, $C = \$86.40$

Q30ci $\overline{AC} = \sqrt{13^2 + 5^2 - 2(13)(5)\cos 135°} \approx 16.9 \approx 17\,\text{km}$

Q30cii $\frac{\sin \angle BAC}{13} \approx \frac{\sin 135°}{16.9}$, $\angle BAC \approx 33°$
Bearing is S 33° W or 213° T

Q30di $y = 2.125 \times 5 + 2.0375 = 12.6625$ km/h

Q30dii $2.125 = r \times \frac{2}{0.8}$, $r = 0.85$

Q30e Height of the cone $= 15 - 6 = 9$ cm
Radius of the cone $= \sqrt{4^2 - 2^2} = 2\sqrt{3}$ cm
Volume of the cone $= \frac{1}{3}\left(\pi\left(2\sqrt{3}\right)^2\right)(9) \approx 113\,\text{cm}^3$

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

© itute 2017