



2017 NSW ESA Mathematics General 2 Solutions

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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

Q2 $95 \times 2.5 = 237.5$

Q3

Q4

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

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

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

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

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

Q10

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

Q12

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

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

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

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

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

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

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

Q20 $4n + 1 \leq 100, n = 24$

Q21

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

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

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

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

C

D

A

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.

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

Q26d $15\,000 \sin 2^\circ \approx 523 \text{ mm}$

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

A

Q27ai 200.875

Q27aia 136.2

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

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

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

D



Q27di 25° W

Q27dii 8 am

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

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

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 $\Pr(S | \text{city}) = \frac{150}{150 + 2500} \approx 0.057$

$\Pr(S | \text{country}) = \frac{70}{70 + 800} \approx 0.080 \therefore$ 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 $\overline{AC} = \sqrt{13^2 + 5^2 - 2(13)(5)\cos 135^\circ} \approx 16.9 \approx 17 \text{ km}$

Q30cii $\frac{\sin \angle BAC}{13} \approx \frac{\sin 135^\circ}{16.9}$, $\angle BAC \approx 33^\circ$

Bearing is S 33° W or 213° T

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

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

Q30e Height of the cone = $15 - 6 = 9 \text{ cm}$

Radius of the cone = $\sqrt{4^2 - 2^2} = 2\sqrt{3} \text{ cm}$

Volume of the cone = $\frac{1}{3}(\pi(2\sqrt{3})^2)(9) \approx 113 \text{ cm}^3$

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