

2023 NSW ESA Mathematics Standard 2 Solutions

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Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	C	D	A	B	C	C	D	D	A	C	B	B	C	A

Q1 $2500 \times 0.03 \times 2 = 150$

B

Q2 $100 - \frac{1}{2}(100 - 68) = 84$

C

Q3

D

Q4 $65000 - 0.22 \times 132600 = 35828$

A

Q5 Check per litre price

B

Q6 Price x without GST, $1.1x = 880 \therefore x = 800$ GST = 80

C

Q7

C

Q8 (S, D) :

$(4,3), (4,4), (4,5), (4,6), (3,4), (3,5), (3,6), (2,5), (2,6), (1,6)$

$\text{Pr} = \frac{10}{24} = \frac{5}{12}$

D

Q9 $7.5 \times 4.5 = 33.75$, $8.5 \times 5.5 = 46.75$

D

Q10 Interest rate per quarter = 2%, number of quarters in 6 years is 24.

A

Q11 Old ratio $2:3 = 60:90$; new ratio $50:80 = 5:8$

C

Q12 Depth = $12.5 - \sqrt{12.5^2 - 10^2} = 5$

B

Q13 $1 - (1 - 0.7)(1 - 0.8) = 0.44 = 44\%$

B

Q14 Minimum cut (less than 30) can be on the left of the cut shown.

C

Q15 $\frac{\text{Total}}{6} = \frac{5x + 90}{6} = 80$, $x = 78$

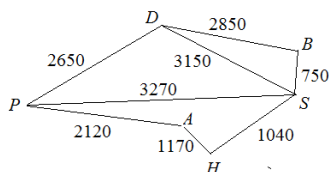
A

Section II

Q16a 120 (read from graph)

Q16b 30 min after, 10:30 am

Q17a



Q17b $1040 + 3150 = 4190$ km

Q18 Symmetric about the mean 49.5; Satisfying the 68% 95% rule

Q19a $ABFGD$

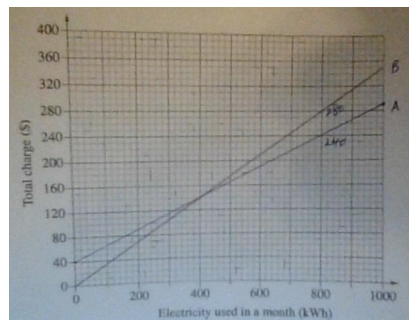
Q19b No, not a minimum spanning tree. Disconnecting BC and then joining DC will provide a lower total edge weight.

Q20a Max $h = 24$ m when $t = 2$ s

Q20b $h = \frac{3}{4} \times 24 = 18$ at $t = 1.3$ s

Q21a $40 + 400 \times 0.25 = 140$

Q21b



Q21c At intersection of the two lines, usage = 400 kwh per month

Q21d At 800 kwh per month, A charges \$240 and B \$280
 \therefore A is cheaper by \$40

Q22a $20 = k \times 50^2$, $k = 0.008$

Q22b Braking distance = $0.008 \times 90^2 = 64.8$ m

Q23 $\text{Pr}(\text{winning both prizes}) = \text{Pr}(\text{winning 1st}) \times \text{Pr}(\text{winning 2nd})$
 $= \frac{5}{100} \times \frac{4}{99} = \frac{1}{495}$

Q24a $\frac{1}{2} \times 4.0 \times (1.9 + 2.7) + \frac{1}{2} \times 4.0 \times (2.7 + 1.7) = 18$ m²

Q24b $18 \times 0.80 \times 3.52 \approx 51$ tonnes

Q25a $13.181x = 450000$, $x \approx 34140$ dollars

Q25b Interest rate per quarter = $\frac{6\%}{4} = 1.5\% = 0.015$,

10 years = 40 periods

Amount = $8535 \times 54.268 = 463177.38$ dollars

Q26a Area = $3 \times 8 - 2.5 \times 7 = 6.5$ m²

Q26b Number of parts = $4 + 2 + 1 - 7$, cement = $\frac{1}{7} \times 2.1 = 0.3$ tonnes

Number of bags = $\frac{0.3 \times 1000}{15} = 20$

Q27a $XP = 15 \cos(180^\circ - 120^\circ) = 7.5$ km

Q27b $\cos \angle CXP = \frac{7.5}{40}$, $\angle CXP \approx 79^\circ$

Bearing of C from X $\approx 180 + 79 = 259^\circ$

Q28 Declining-balance method would give a lower salvage value.

Straight-line method: Salvage value = $60000 - 3500 \times 3 = 49500$

Declining-balance method:

Salvage value = $60000(1 - 0.12)^3 \approx 40888.32$

Q29a Monthly repayment = $7.72 \times \frac{520000}{1000} = 4014.40$

Total repayment = $4014.40 \times 25 \times 12 = 1204320$ dollars

Q29b Borrowed amount = $\frac{3596}{8.99} \times 1000 = 400000$ dollars

Q30 Value of items with GST = x , $0.1x = 3.86 \therefore x = 38.60$
 Value of items with no GST = $124.87 - 38.60 - 3.86 = 82.41$ dollars

Q31a The two critical paths: *HIK*, *HIGC*

Q31b Task *I*, $7 - 3 = 4$ hours

Q32a Rate per day = $\frac{13.5\%}{365} \approx 0.000369863$

Interest = $450 \times 1.000369863^{21} - 450 \approx 3.51$ dollars (3.508)

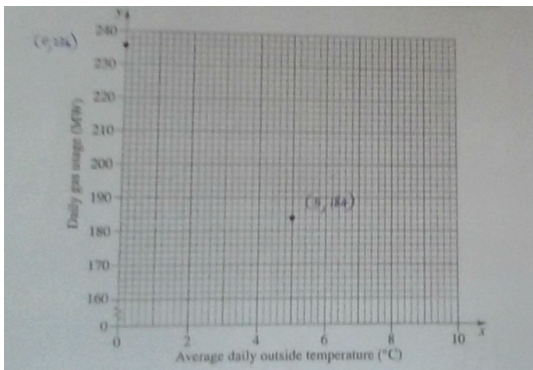
Q32b $\frac{3.508}{450 \times 1.000369863^{21}} \approx 0.0077 = 0.77\%$

Q33 Arc $PQ = \frac{110}{360} \times 2\pi \times 2.1 \approx 4.03171$

Line segment $PQ = 2 \times 2.1 \sin \frac{110^\circ}{2} \approx 3.44044$

Perimeter = $2(3.6 + 8.0) - \text{line } PQ + \text{arc } PQ \approx 23.8$ m

Q34a $\bar{x} = 5$, $\bar{y} = 184$ (5, 184) (0, 236)



Q34b Gradient = $\frac{184 - 236}{5 - 0} = -10.4$, equation: $y = -10.4x + 236$

Q24c When $x = 23$, $y = -3.2$ i.e. negative gas usage, not making sense

Q35 $\angle ACB = 180 - 60 - 25 = 95^\circ$, $\frac{AB}{\sin 95^\circ} = \frac{12}{\sin 25^\circ}$, $AB = 28.286$

Area $\approx \frac{1}{2} \times 28.286 \times 12 \sin 60^\circ \approx 147$ m²

Q36 $0.02 = \frac{10 \times 3 - 7.5H}{6.8 \times 75}$, $H = 2.64$ h

At 9:00 pm - 2.64 h = 6.36 h $\approx 6:22$ pm ($0.36 \times 60 \approx 22$)

Q37 $18292 + \frac{X}{100}(90000 - 78800) = 25.8\% \times 90000$, $X = 44$

Q38 $z = \frac{11.93 - 10.40}{1.15} \approx 1.330435$

$\Pr(z > 1.33) = 1 - \Pr(z < 1.33) = 1 - 0.9082 = 0.0918$

Number $\approx 400 \times 0.0918 \approx 37$

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