# 2021 NSW ESA Mathematics Standard 2 Solutions



## Section I

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

Q1 A

Q2 D

Q3 C

Q4 $2467\times(1-0.15)^3\approx1515.05$ D

Q5 B

Q6 A

Q7 Check the cumulative downloads up to (including) Day 10. C

Q8 $\dfrac{x-63}{8}=2,\ x=79$ D

Q9 C

Q10 $y$-intercept A

Q11 $\dfrac{3}{8}\times\dfrac{5}{7}+\dfrac{5}{8}\times\dfrac{3}{7}=\dfrac{15}{28}$ D

Q12 $\dfrac{1}{2}\times6(1.2+2\times2+1.4)=19.8$ B

Q13 $60=\dfrac{k}{8},\ k=480,\ T=\dfrac{480}{10}=48$ B

Q14 D

Q15 $professional:amateur:total=3:16:19$
Completed the race –
$professional:amateur=\left(\dfrac{3}{19}\times11400\right):\left(\dfrac{16}{19}\times11400-600\right)$ B
$=1:5$

## Section II

Q16 $\dfrac{1}{2}\times\dfrac{4}{3}\pi\times2^3\approx16.8\,\text{m}^3$

Q17 Yes, $\text{IQR}=10-4=6,\ 20>10+1.5\times6$

Q18 $1560\times\dfrac{6.7}{100}\times\$1.45\approx\$151.55$

Q19 $x-5\times2300=7500,\ x=19000$ dollars

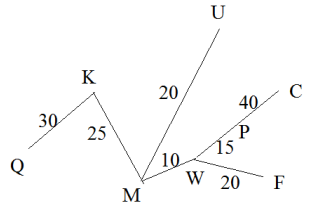
Q20 time difference $=\dfrac{151-16}{15}=9$ hours
When City A time is 5:00 pm Thursday, Sydney time (plus 9 hours) is 2:00 am Friday.

Q21 Monthly rate $=\dfrac{22.65}{15101.55}\times100\%\approx0.15\%$

| | | | | |
|---|---|---|---|---|
| 7 | 15624.20 | 23.44 | 500 | 16147.64 |

Q22 Taxable income $=84000-900-474=82626$ dollars
Tax + Levy
$=5092+(82626-45000)\times0.325+82626\times2\%=\$18972.97$

Q23a Length $=30+25+20+10+15+20+40=160$

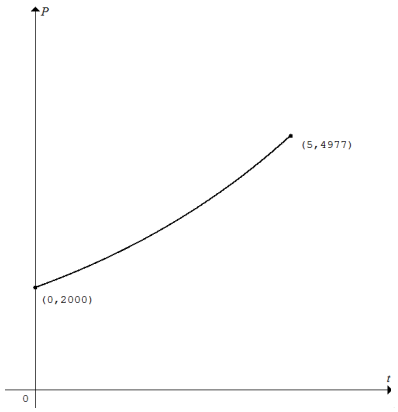



Q23b $45+20=65$

Q24a $t=0,\ P=2000$

Q24b $t=5,\ P=4976.64\approx4977$

Q24c




Q25 $1\,\text{cm}\equiv0.030\,\text{km}$, distance $=0.030\times26=0.780\,\text{km}$
$12\,\text{min}=0.20\,\text{h}$ .: Average speed $=\dfrac{0.780}{0.20}=3.9$ km per hour

Q26a $35000\times\left(1+\dfrac{0.06}{12}\right)^{12}\approx37158.72$ dollars

Q26b $35000\times\left(1+\dfrac{r}{100}\right)\approx37158.72,\ r\approx6.17$

Q27a Difference in power $=16\,\text{W}=0.016\,\text{kW}$
Number of hours $=3\times365=1095\,\text{h}$
Energy usage per year (kWh) $=0.016\times1095=17.52$
Difference in annual cost $\$0.25\times17.52=\$4.38$

Q27b $4.38n=921.90-900,\ n=5$ years

Q28a Use points $(0,2)$ and $(5,18)$, $m=\dfrac{18-2}{5}=3.2,\ y=3.2x+2$

Q28b Increase

Q29 $x+\frac{x-1}{2}=9,\ 2x+x-1=18,\ 3x=19,\ x=\frac{19}{3}$

Q30 Dividend yield $=\frac{810}{1500\times 27}=0.02=2\%$

Q31 Monthly payment $=\frac{500000}{289.75411}\approx 1725.60$

Q32a $XY=16\cos 30°\approx 13.86\,\text{cm}$

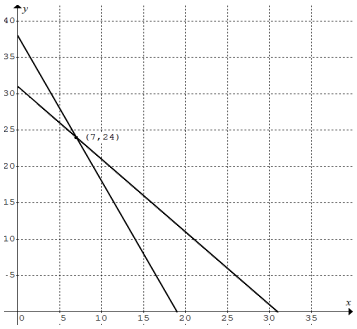
Q32b Area $=\frac{1}{2}\pi\times 8^2-\frac{1}{2}\times 13.86\times 16\sin 30°\approx 45.1\,\text{cm}^2$

Q33ai $y=29.2-0.011\times 540\approx 23.3°\text{C}$

Q33aii For each metre increase in height above sea level, the average maximum daily temperature drops by $0.011°\text{C}$.

Q33b Latitude, because the data points are closer to the regression line. $|r|=0.897>0.494$

Q34 $4x+2y=76$




Number of goannas $=7$ Number of emus $=24$

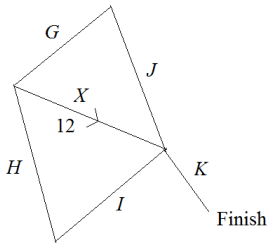
Q35a $x=\frac{-10+100}{2}=45$ Price for each book $10+45=55$ dollars

Q35b When $x=0$, $R=50000$

Q36a Minimum time $=5+7+2+3+5+8+10=40$ minutes

Q36b *ACDEGJK*

Q36c Float time $=1$ minute




Q37 $\frac{\sin\angle ABC}{25}=\frac{\sin 28°}{16}$, $\angle ABC\approx 47°$ or $133°$

Since the angle is obtuse, $\angle ABC\approx 133°$.

Q38a $0.5-0.1179=0.3821$

Q38b $z=\frac{3471-3300}{570}=0.3$

$\Pr(W>3471)=\Pr(Z>0.3)=0.3821$

Number of babies $=1000\times 0.3821\approx 382$

Q39a $\frac{1}{2}\times 28\times 35\times\sin\angle COB=466$, $\angle COB\approx 72°$

Q39b $\angle COD=330°-150°-72°=108°$

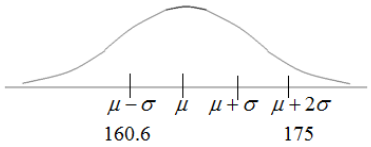
$\overline{CD}=\sqrt{31^2+28^2-2\times 31\times 28\times\cos 108°}\approx 47.8$

Fencing $=31+28+47.8=106.8$ m

Q40 After the 8th deposit, amount $=1000\times 8.2132=8213.20$ dollars

Two more years, amount $8213.20\times\left(1+\frac{1.25}{100}\right)^2\approx 8419.81$ dollars

Q41




Females: $\mu+2\sigma=175$ and $\mu-\sigma=160.6$

$\therefore\ \mu=165.4$ and $\sigma=4.8$

Males: $\mu=1.05\times 165.4=173.67$ and $\sigma=1.1\times 4.8=5.28$

Selected male:

$\Pr(H<h)=84\%$, $h=\mu+\sigma=173.67+5.28=178.95$ cm

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