

Upper and lower bounds – Answers

Upper and lower bounds

Part A

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|----------------------------|------------------------------|-----------------------------|
| 1) $3.75 \leq x < 3.85$ | 2) $4.255 \leq x < 4.265$ | 3) $0.0035 \leq x < 0.0045$ |
| 4) $3.695 \leq x < 3.705$ | 5) $1335 \leq x < 1345$ | 6) $34.65 \leq x < 34.75$ |
| 7) $2650 \leq x < 2750$ | 8) $0.0575 \leq x < 0.0585$ | 9) $4.25 \leq x < 4.35$ |
| 10) $4.295 \leq x < 4.305$ | 11) $8499.5 \leq x < 8500.5$ | 12) $8495 \leq x < 8505$ |
| 13) $8450 \leq x < 8550$ | 14) $7750 \leq x < 7850$ | 15) $7795 \leq x < 7805$ |

Part B

- 1) Volume of cylinder $V = \pi r^2 h$
Max $V = \pi \times 4.65^2 \times 125 = 8491.13... \text{ cm}^3$
Min $V = \pi \times 4.55^2 \times 115 = 7479.46... \text{ cm}^3$
- 2) Volume of sphere $V = \frac{4}{3} \pi r^3$ so minimum $V = \frac{4}{3} \times \pi \times 3.17^3 = 133.4 \text{ cm}^3$
- 3) $\max R = \frac{\max a - \min b}{\min t} = \frac{130.5 - 67.5}{19.5} = 3.23 \text{ cm/s}$
- 4) (a) $S = 15 \text{ cm/s}$
(b) Max $S = 15.806... \text{ cm/s}$ Min $S = 14.24... \text{ cm/s}$
(c) Max error = 0.806 cm/s (3sf)
(d) 5.4% (2sf)

Upper and lower bounds 2

- 1) (a) $3.75 \leq x < 3.85$ (b) $3.795 \leq x < 3.805$ (c) $3.7 \leq x < 3.9$
(d) $395 \leq x < 405$ (e) $1.345 \leq x < 1.355$ (f) $1.325 \leq x < 1.375$
- 2) (a) $5.25\text{cm} : 10500\text{cm} = 1:2000$ so largest $n = 2000$
(b) $7.85\text{cm} \times 2000 = 157\text{m}$
(a2) $5.35\text{cm} : 9500\text{cm} = 1:1775.7$ (b2) $7.75\text{cm} \times 1775.7 = 137.62\text{m}$
- 3) $\max AC = \sqrt{13.05^2 - 7.5^2} = 10.7\text{cm}$ $\min AC = \sqrt{12.95^2 - 7.7^2} = 10.4\text{cm}$
- 4) $\max \frac{x}{y} = \frac{82.5}{25} = 3.3$ $\min \frac{x}{y} = \frac{77.5}{53} = 2.21$ (3sf)

Y10 Upper and Lower Bounds

- 1) (a) 861m (b) 839m (c) 29497.5 m^2 (d) 28307.5 m^2
- 2) (a) 70.725m (b) 65.325m
- 3) (a) 1.6kg (b) 1.5kg
- 4) (a) 15.8cm/s (b) 14.2cm/s