

## Chapter 16

### Exercise 16A

- 1 a 235 kg, 265 kg  
b 118 mm, 186 mm  
c 12.8 mg, 13.4 mg  
d 37 ml, 38 ml  
e 8.2 mg, 8.3 mg  
f 0.65 mm, 0.656 mm  
g 6.544 mm, 6.554 mm  
h  $5.35\mu\text{m}$ ,  $5.41\mu\text{m}$   
i  $0.739\mu\text{m}$ ,  $0.741\mu\text{m}$
- 2 a  $(2.95 \pm 0.05)\text{cm}$   
b  $(98.8 \pm 1.2)\text{g}$   
c  $(98.2 \pm 0.9)^{\circ}\text{F}$   
d  $(1.4 \pm 0.05)\text{kg}$   
e  $(49.74 \pm 0.15)\text{ml}$   
f  $(1.246 \pm 0.012)\mu\text{m}$
- 3 14.4 mm, 17.6 mm.
- 4 a  $(11 \pm 1)\mu\text{m}$   
 $(17 \pm 2)\mu\text{m}$   
 $(22 \pm 10)\mu\text{m}$   
 $(34 \pm 11)\mu\text{m}$   
 $(65 \pm 5)\mu\text{m}$   
b  $(0.011 \pm 0.001)\text{mm}$   
 $(0.017 \pm 0.002)\text{mm}$   
 $(0.022 \pm 0.010)\text{mm}$   
 $(0.034 \pm 0.011)\text{mm}$   
 $(0.065 \pm 0.005)\text{mm}$   
c Approximately 6.
- 5 3.75 kg, 3.85 kg.
- 6 58 mm, 118 mm.
- 7 595 kg.
- 8 3.995 m, 4.005 m.
- 9  $10(15 + 0.5) = 155$ , so – No, if he is unlucky the tolerances will work against him.

**Activity:** Exercise for student.

### Exercise 16B

- 1  $3 \times 50\text{cm}$  or  $5 \times 30\text{cm}$ .
- 2 Need to avoid door too big for frame. Biggest door is 77cm, smallest frames are 74 and 76 cm. So neither is safe bet.
- 3 Short beam too short for largest gap and long beam too long for narrowest gap.
- 4 Recalibration necessary as 25% outside interval.
- 5 Just within allowances.

### Exercise 16C

- 1 257 kg, 277 kg
- 2 Allowing for tolerances, time could be 55.4 s.
- 3 a 4360 g      b 13.
- 4 14, 15.
- 5 16.
- 6  $3260.25\text{ cm}^2$
- 7  $(5465.18 \pm 102.62)\text{cm}^3$
- 8 No.
- 9 Assuming large dimensions are 180.5, 130.5, 120.5 then 2129 l
- 10 a No, could be 456 ml  
b 9135, 10961  
c £3288.60, £3945.96
- 11 a  $(900.01 \pm 6)\text{cm}^2$       b 66  
c 68      d rectangle
- 12 a  $64.08\text{ cm}^2$ ,  $69.58\text{ cm}^2$   
b 1237 g, 1343 g  
c £29799.33, £32352.87
- 13 2 hours 1 min, 2 hours 14 min
- 14 No.
- 15 a 10.35 s, 10.45 s  
b 9.57 m/s, 9.66 m/s

### Activity

- 1 a Not non-standard  
b Yes  
c (i) less than 388 g  
(ii) less than 376 g
- 2 Exercise for student.