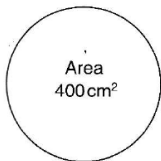
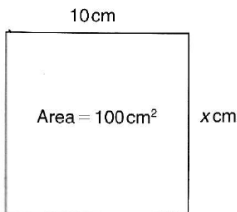
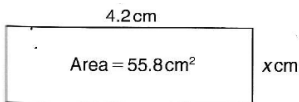
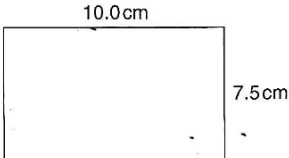
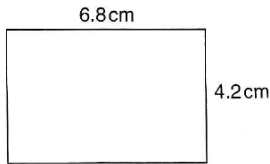
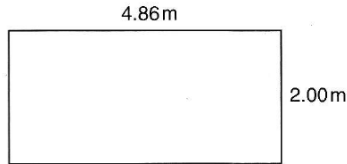


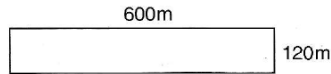
Exercise 2.3



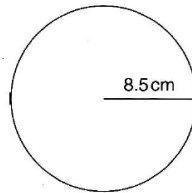
1. The masses to the nearest 0.5 kg of two parcels are 1.5 kg and 2.5 kg. Calculate the lower and upper bounds of their combined mass.
2. Calculate upper and lower bounds for the perimeter of the rectangle shown (left), if its dimensions are correct to 1 d.p.
3. Calculate upper and lower bounds for the perimeter of the rectangle shown below, whose dimensions are accurate to 2 d.p.



4. Calculate upper and lower bounds for the area of the rectangle shown (left), if its dimensions are accurate to 1 d.p.
5. Calculate upper and lower bounds for the area of the rectangle shown below, whose dimensions are correct to 2 s.f.

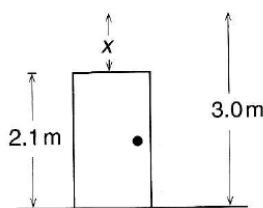
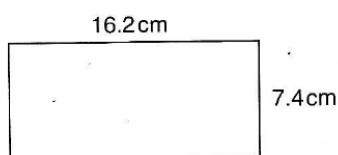


6. Calculate upper and lower bounds for the length marked x cm in the rectangle (left). The area and length are both given to 1 d.p.
7. Calculate the upper and lower bounds for the length marked x cm in the rectangle (left). The area and length are both accurate to 2 s.f.
8. The radius of the circle shown below is given to 1 d.p. Calculate the upper and lower bounds of:
 - a) the circumference,
 - b) the area.

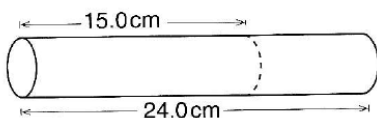
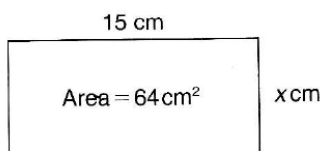


9. The area of the circle shown (left) is given to 2 s.f. Calculate the upper and lower bounds of:
 - a) the radius,
 - b) the circumference.
10. The mass of a cube of side 2 cm is given as 100 g. The side is accurate to the nearest millimetre and the mass accurate to the nearest gram. Calculate the maximum and minimum possible values for the density of the material (density = mass \div volume).
11. The distance to the nearest 100 000 km from Earth to the moon is given as 400 000 km. The average speed to the nearest 500 km/h of a rocket to the moon is given as 3500 km/h. Calculate the greatest and least time it could take the rocket to reach the moon.

NB: All diagrams are not drawn to scale.



NB: All diagrams are not drawn to scale.



Student Assessment 1

- Calculate the upper and lower bounds of the following calculations given that each number is written to the nearest whole number.
 - 20×50
 - 100×63
 - $\frac{500}{80}$
 - $\frac{14 \times 73}{20}$
 - $\frac{17 - 7}{4 + 6}$
 - $\frac{8 \times (3 + 6)}{10^2}$
- In the rectangle (left) both dimensions are given to 1 d.p. Calculate the upper and lower bounds for the area.
- An equilateral triangle has sides of length 4 cm correct to the nearest whole number. Calculate the upper and lower bounds for the perimeter of the triangle.
- The height to 1 d.p. of a room is given as 3.0 m. A door to the room has a height to 1 d.p. of 2.1 m. Write as an inequality the upper and lower bounds for the gap between the top of the door and the ceiling.
- The mass of 85 oranges is given as 40 kg correct to 2 s.f. Calculate the lower and upper bounds for the average mass of one orange.

Student Assessment 2

- Calculate the upper and lower bounds of the following calculations given that each number is written to the nearest whole number.
 - 25×5
 - 10×100
 - $\frac{400}{60}$
 - $\frac{10 \times 9}{1}$
 - $\frac{7 - 2}{2 + 8}$
 - $\frac{4 \times (8 - 5)}{6^2}$
- In the rectangle (left) both the length and area are given to 2 s.f. Calculate the upper and lower bounds for the width x cm.
- An equilateral triangle has sides of length 5.2 cm correct to 1 d.p. Calculate the upper and lower bounds for the perimeter of the triangle.
- A metal rod is 24.0 cm long. A length of 15.0 cm is cut from it. Both measurements are correct to 1 d.p. Give as an inequality the upper and lower bounds of the length l cm of the rod that is left.
- The mass of 60 potatoes is given as 42 kg correct to 2 s.f. Calculate the lower and upper bounds for the average mass of one potato.

Student Assessment 3

1. Five boys have a mass, given to the nearest 10 kg, of: 40 kg, 50 kg, 50 kg, 60 kg and 80 kg. Calculate the least possible total mass.
2. A water tank measures 30 cm by 50 cm by 20 cm. If each of these measurements is given to the nearest centimetre, calculate the largest possible volume of the tank.
3. The volume of a cube is given as 125 cm^3 to the nearest whole number.
 - a) Express as an inequality the upper and lower bounds of the cube's volume.
 - b) Express as an inequality the upper and lower bounds of the length of each of the cube's edges.
4. The radius of a circle is given as 4.00 cm to 2 d.p. Express as an inequality the upper and lower bounds for:
 - a) the circumference of the circle,
 - b) the area of the circle.
5. A cylindrical water tank has a volume of 6000 cm^3 correct to 1 s.f. A full cup of water from the tank has a volume of 300 cm^3 correct to 2 s.f. Calculate the maximum number of full cups of water that can be drawn from the tank.
6. A match measures 5 cm to the nearest centimetre. 100 matches end to end measure 5.43 m correct to 3 s.f.
 - a) Calculate the upper and lower limits of the length of one match.
 - b) How can the limits of the length of a match be found to 2 d.p.?

Student Assessment 4

1. The masses to 1 d.p. of three books are 0.7 kg, 0.1 kg and 0.2 kg. What are the lower and upper bounds of their combined mass?
2. A box has dimensions 8 cm, 12 cm and 15 cm. Each of these measurements is given to the nearest whole number. Calculate:
 - a) the lower and upper bounds of its volume,
 - b) the lower and upper bounds of its total surface area.
3. A square has an area of 64 cm^2 given to 2 s.f. Express as an inequality the upper and lower bounds for:
 - a) the area of the square,
 - b) the perimeter of the square.
4. The mass of a cube of side 15 cm is given as 1 kg. The side is correct to 0.5 cm and the mass accurate to 10 g. Calculate the upper and lower bounds of the density of the material (density = mass \div volume).
5. A single ball bearing has a mass of 8 g to the nearest gram. 100 ball bearings have a mass of 807 g to the nearest gram.
 - a) State the lower and upper bounds for the value of one ball bearing.
 - b) How can the limits of the mass of a ball bearing be found to 2 d.p.?
6. The radius of a circle to 2 d.p. is given as 6.00 cm. Express as an inequality the upper and lower bounds for:
 - a) C cm, the circumference of the circle,
 - b) $A \text{ cm}^2$, the area of the circle.

ANSWERS

Exercise 2.2

1.
 - a) Lower bound = 263.25
Upper bound = 297.25
 - b) Lower bound = 3295.25
Upper bound = 3455.25
 - c) Lower bound = 4925.25
Upper bound = 5075.25
 - d) Lower bound = 3.76
Upper bound = 4.26 (2 d.p.)
 - e) Lower bound = 2.83
Upper bound = 3.19 (2 d.p.)
 - f) Lower bound = 8.03
Upper bound = 8.66 (2 d.p.)
 - g) Lower bound = 44.95
Upper bound = 52.82 (2 d.p.)
 - h) Lower bound = 39.77
Upper bound = 42.23 (2 d.p.)
 - i) Lower bound = 16.14
Upper bound = 18.88 (2 d.p.)
 - j) Lower bound = 3.55
Upper bound = 7.12 (2 d.p.)
 - k) Lower bound = 1.47
Upper bound = 1.63 (2 d.p.)
 - l) Lower bound = 18.51
Upper bound = 28.59 (2 d.p.)
2.
 - a) Lower bound = 6.7
Upper bound = 6.9
 - b) Lower bound = 29.69
Upper bound = 30.80 (2 d.p.)
 - c) Lower bound = 147.76
Upper bound = 150.25 (2 d.p.)
 - d) Lower bound = 13.3
Upper bound = 13.5
 - e) Lower bound = 1.75
Upper bound = 1.81 (2 d.p.)
 - f) Lower bound = 0.39
Upper bound = 0.46 (2 d.p.)
 - g) Lower bound = 34.10
Upper bound = 40.03 (2 d.p.)
 - h) Lower bound = 0.98
Upper bound = 1.02 (2 d.p.)
 - i) Lower bound = 0
Upper bound = 0.04
3.
 - a) Lower bound = 20 002.5
Upper bound = 20 962.5
 - b) Lower bound = 1.06
Upper bound = 1.15 (2 d.p.)
 - c) Lower bound = 1 116 250
Upper bound = 1 188 250
 - d) Lower bound = 88.43
Upper bound = 91.60 (2 d.p.)
 - e) Lower bound = 131.75
Upper bound = 139.34 (2 d.p.)

- f) Lower bound = 18.95
Upper bound = 20.39 (2 d.p.)
- g) Lower bound = 2.24
Upper bound = 2.53 (2 d.p.)
- h) Lower bound = 3.61
Upper bound = 3.97 (2 d.p.)
- i) Lower bound = 60.34
Upper bound = 68.52 (2 d.p.)

Exercise 2.3

1. Lower bound = 3.5 kg
Upper bound = 4.5 kg
2. Lower bound = 21.8 cm
Upper bound = 22.2 cm
3. Lower bound = 13.7 m
Upper bound = 13.74 m
4. Lower bound = 74.13 cm²
Upper bound = 75.88 cm² (2 d.p.)
5. Lower bound = 68 425 m²
Upper bound = 75 625 m²
6. Lower bound = 13.1
Upper bound = 13.5 (1 d.p.)
7. Lower bound = 9.5 cm
Upper bound = 10.6 cm (1 d.p.)
8.
 - a) Lower bound = 53.1 cm
Upper bound = 53.7 cm (1 d.p.)
 - b) Lower bound = 224.3 cm²
Upper bound = 229.7 cm² (1 d.p.)
9.
 - a) Lower bound = 11.2 cm
Upper bound = 11.4 cm (1 d.p.)
 - b) Lower bound = 70.5 cm
Upper bound = 71.3 cm (1 d.p.)
10. Lower bound = 11.5 g/cm³
Upper bound = 13.6 g/cm³ (1 d.p.)
11. Least = 93.3 h Greatest = 138.5 h (1 d.p.)

Student Assessment 1

1.
 - a) Lower bound = 965.25
Upper bound = 1035.25
 - b) Lower bound = 6218.75
Upper bound = 6381.75
 - c) Lower bound = 6.2
Upper bound = 6.3 (1 d.p.)
 - d) Lower bound = 47.7
Upper bound = 54.7 (1 d.p.)
 - e) Lower bound = 0.8
Upper bound = 1.2 (1 d.p.)
 - f) Lower bound = 0.5
Upper bound = 2.1 (1 d.p.)

2. Lower bound = 118.7 cm^2
Upper bound = 121.1 cm^2 (1 d.p.)
3. Lower bound = 10.5 cm
Upper bound = 13.5 cm
4. $0.8 \leq x < 1$
5. Lower bound = 0.46 kg
Upper bound = 0.48 kg (2 d.p.)

Student Assessment 2

1. a) Lower bound = 110.25
Upper bound = 140.25
b) Lower bound = 945.25
Upper bound = 1055.25
c) Lower bound = 6.6
Upper bound = 6.7 (1 d.p.)
d) Lower bound = 53.8
Upper bound = 199.5 (1 d.p.)
e) Lower bound = 0.4
Upper bound = 0.7 (1 d.p.)
f) Lower bound = 0.2
Upper bound = 0.6 (1 d.p.)
2. Lower bound = 4.1 cm
Upper bound = 4.5 cm (1 d.p.)
3. Lower bound = 15.45 cm
Upper bound = 15.75 cm (2 d.p.)
4. $8.9 \leq x < 9.1$
5. Lower bound = 0.69 kg
Upper bound = 0.71 kg (2 d.p.)

Student Assessment 3

1. 255 kg
2. $31\,575 \text{ cm}^3$ (5 s.f.)
3. a) $124.5 \leq V < 125.5 \text{ cm}^3$
b) $4.99 \leq L < 5.01 \text{ cm}$ (2 d.p.)
4. a) $25.10 \leq C < 25.16$ (2 d.p.)
b) $50.14 \leq A < 50.39 \text{ cm}^2$ (2 d.p.)
5. 22 cups
6. a) Lower bound = 4.5 cm
Upper bound = 5.5 cm
b) Lower bound = 5.43 cm
Upper bound = 5.44 cm

Student Assessment 4

1. Lower bound = 0.85 kg
Upper bound = 1.15 kg
2. a) Lower bound = 1251 cm^3
Upper bound = 1647 cm^3 (4 s.f.)
b) Lower bound = 723.5 cm^2
Upper bound = 863.5 cm^2

3. a) $63.5 \leq A < 64.5 \text{ cm}^2$
b) $15.9 \leq P < 16.1 \text{ cm}$ (1 d.p.)
4. Lower bound = 0.28 g/cm^3
Upper bound = 0.31 g/cm^3 (2 d.p.)
5. a) Lower bound = 7.5 g
Upper bound = 8.5 g
b) Lower bound = 8.07 g
Upper bound = 8.08 g (2 d.p.)
6. a) $37.67 \leq C < 37.73 \text{ cm}$ (2 d.p.)
b) $112.91 \leq A < 113.29 \text{ cm}^2$ (2 d.p.)