Using Upper and Lower Bounds - Grade 9 Practice

1. A rectangle has sides of 6 cm and 9 cm to the nearest mm. Find to 2 d.p.:

a. its maximum possible area.

b. its minimum possible area.

2. A sprinter runs 100 m in 12.1 seconds. The track has been measured to the nearest 10 cm and the time is given to the nearest 0.1 seconds. Giving your answers to 1 d.p.:

a. what is the sprinter's maximum average speed?

b. what is the sprinter's minimum average speed?

3. A cube of side length 7 m to the nearest 0.1 m has a mass of 40 kg to 2 significant figures.

a. What is the maximum density of the cube?

b. What is the minimum density of the cube?

4. Izzy walks 2 km in 30 minutes. Given that the distance is measured to the nearest 50 m and the time is given to the nearest minute, find in km/h:

a. Izzy's maximum average speed.

b. Izzy's minimum average speed.

5. James wants to paint the ceiling in his living room. The room measures 6 m by 5.4 m. One litre of paint will cover 3 m^2. James has 11 litres of paint. All measurements have been rounded to one decimal place.

   Does James definitely have enough paint to cover the ceiling in one coat?

6. A swimming pool measuring 25 m long by 10 m wide is filled with 375 000 litres of water. The lengths are given to the nearest 10 cm. The volume is given to 3 significant figures. Giving your answers to 2 d.p., find:

a. the maximum depth of the water in the pool.

b. the minimum depth of the water in the pool.

7. The formula for kinetic energy is K.E. = 1/2 × mass × velocity^2 where K.E. is in joules, mass is in kg and velocity is in ms^{-1}. Given that the kinetic energy possessed by an object with mass 3 kg (to the nearest 100g) is 38 J (to the nearest whole number) find:

a. the maximum velocity of the object.

b. the minimum velocity of the object.

Using Upper and Lower Bounds - Grade 9 Practice Answer sheet

1. A rectangle has sides of 6 cm and 9 cm to the nearest mm. Find to 2 d.p.:

a. its maximum possible area. $6.05 \times 9.05 = 54.75\ cm^2$

b. its minimum possible area. $5.95 \times 8.95 = 53.25\ cm^2$

2. A sprinter runs 100 m in 12.1 seconds. The track has been measured to the nearest 10 cm and the time is given to the nearest 0.1 seconds. Giving your answers to 1 d.p.:

a. what is the sprinter's maximum average speed? $100.05 / 12.05 = 8.3\ ms^{-1}$

b. what is the sprinter's minimum average speed? $99.95 / 12.15 = 8.2\ ms^{-1}$

3. A cube of side length 7 m to the nearest 0.1 m has a mass of 40 kg to 2 significant figures.

a. What is the maximum density of the cube? $40.5 / 6.95^3 = 0.12\ kg\ m^{-3}$

b. What is the minimum density of the cube? $39.5 / 7.05^3 = 0.11\ kg\ m^{-3}$

4. Izzy walks 2 km in 30 minutes. Given that the distance is measured to the nearest 50 m and the time is given to the nearest minute, find in km/h:

a. Izzy's maximum average speed. $2.025 / 29.5 = 0.0686$ km/min $= 4.12$ km/h

b. Izzy's minimum average speed. $1.975 / 30.5 = 0.065$ km/min $= 3.89$ km/h

5. James wants to paint the ceiling in his living room. The room measures 6 m by 5.4 m. One litre of paint will cover 3 m^2. James has 11 litres of paint. All measurements have been rounded to one decimal place.

   Does James definitely have enough paint to cover the ceiling in one coat? No

   Maximum room area $= 6.05 \times 5.45 = 32.97\ m^2$ Minimum paint cover $= 10.95 \times 2.95 = 32.3\ m^2$

6. A swimming pool measuring 25 m long by 10 m wide is filled with 375 000 litres of water. The lengths are given to the nearest 10 cm. The volume is given to 3 significant figures. Giving your answers to 2 d.p., find:

a. the maximum depth of the water in the pool. $375.5 / (24.95 \times 9.95) = 1.51$ m

b. the minimum depth of the water in the pool. $374.5 / (25.05 \times 10.05) = 1.49$ m

7. The formula for kinetic energy is K.E. $= 1/2 \times$ mass $\times$ velocity^2 where K.E. is in joules, mass is in kg and velocity is in ms^{-1}. Given that the kinetic energy possessed by an object with mass 3 kg (to the nearest 100g) is 38 J (to the nearest whole number) find:

a. the maximum velocity of the object. $\sqrt{((2 \times 38.5)/2.95)} = 5.11\ ms^{-1}$

b. the minimum velocity of the object. $\sqrt{((2 \times 37.5)/3.05)} = 4.96\ ms^{-1}$