3.1 Error Intervals: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The mass of a parcel is 30700 kg. The value has been truncated to the nearest 100 kg (rounded down).
Write down the error interval for the mass, using the letter m.

(Total for Question 1 is 2 marks)

---

2 The distance of a journey is 250 km, correct to the nearest 1 km.
Write down the error interval for the distance, using the letter d.

(Total for Question 2 is 2 marks)

---

3 The length of a table is 5.43 cm, correct to the nearest 0.01 cm.
Write down the error interval for the length, using the letter l.

(Total for Question 3 is 2 marks)

---

4 A number is 4.6, correct to 2 significant figures. Write down the lower and upper bounds using inequalities.

(Total for Question 4 is 2 marks)

© Revision Library | revisionlibrary.co.uk

5 x is 2.3, correct to 1 decimal place. Work out the greatest possible value of 3x. Give your answer as an inequality.

(Total for Question 5 is 3 marks)

---

6 A length is 4.6 m correct to 1 decimal place. A second length is 2.31 m correct to 2 decimal places.
Work out the greatest possible value of the sum of the two lengths. Give your answer to 2 decimal places.

(Total for Question 6 is 3 marks)

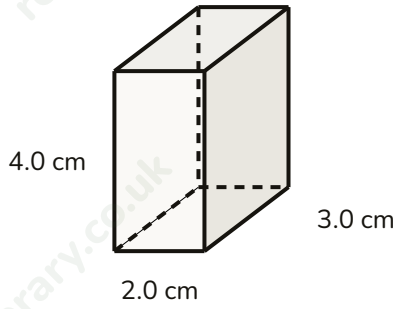
© Revision Library | revisionlibrary.co.uk

7 A value x is given as 0.8 correct to 1 significant figure. A value y is given as 0.06 correct to 1 significant figure.
Work out the possible range for x + y. Give your answer as an inequality with lower bound and upper bound.

(Total for Question 7 is 4 marks)

---

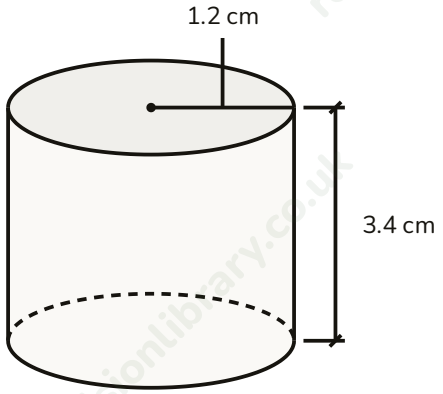
8 A cuboid has dimensions 2.0 cm, 3.0 cm and 4.0 cm, each given to 2 significant figures. Work out the greatest possible volume. Give your answer as an inequality.



(Total for Question 8 is 3 marks)

© Revision Library | revisionlibrary.co.uk

9 A metal cylinder has radius 1.2 cm, given to 2 significant figures, and height 3.4 cm, given to 1 decimal place.
Work out the least possible volume of the cylinder. Use $\pi = 3.142$ and give your answer to 2 decimal places. (Volume = $\pi * r^2 * h$.)



(a) Write the error intervals for the radius and the height. **(2)**

.....

(b) Using the least possible radius and least possible height, work out the least possible volume. Give your answer to 2 decimal places using $\pi = 3.142$. **(2)**

.....

(Total for Question 9 is 4 marks)

---

10 The mass of a small package is given as 250 g correct to the nearest 10 g. The number of packages in a box is recorded as 24 correct to the nearest whole number.

(a) Find the possible range for the total mass of the packages in the box. **(2)**

.....

(b) Giving your answer to the nearest 10 g, find the possible value(s) of the mean mass per package to 3 significant figures. **(1)**

.....

(Total for Question 10 is 3 marks)

© Revision Library | revisionlibrary.co.uk

11 A rectangle has length 7.8 cm, correct to 2 significant figures, and width 2.45 cm, correct to 3 significant figures. Work out the least possible perimeter of the rectangle. Give your answer to 2 decimal places.



(Total for Question 11 is 4 marks)

---

12 Given that a and b are measured values with a in [1.98, 2.02] and b in [0.495, 0.505], find a range for the value of (a / b). Give answers to 3 significant figures.
You must show how you obtain the minimum and maximum values.

(Total for Question 12 is 5 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 3.1 Error Intervals: 1-hour Pack

Question 1

lower limit 30700 with ≤ **B1**

upper limit 30800 with < **B1**

Answer: 30700 ≤ m < 30800

Question 2

lower limit with ≤ **B1**

upper limit with < **B1**

Answer: 249.5 ≤ d < 250.5

Question 3

lower limit with ≤ **B1**

upper limit with < **B1**

Answer: 5.425 ≤ l < 5.435

Question 4

identify bounds 4.55 ≤ x < 4.65 or equivalent oe **M1**

4.55 ≤ x < 4.65 cao **A1**

Answer: 4.55 ≤ x < 4.65

Question 5

use upper bound x < 2.35 **M1**

multiply by 3: 3x < 3*2.35 **M1**

3x < 7.05 cao **A1**

Answer: 3x < 7.05. WorkingCheck: x < 2.35 so 3x < 3*2.35 = 7.05.

Question 6

identify upper bound for 4.6 as 4.65 **M1**

identify upper bound for 2.31 as 2.315 and add to get 6.965 **M1**

6.97 cao to 2 dp **A1**

Answer: 6.97 (m)

Question 7

identify bounds for x: 0.75 ≤ x < 0.85 and for y: 0.055 ≤ y < 0.065 **M1**

add lower bounds and add upper bounds correctly **M1**

0.805 ≤ x+y < 0.915 cao **A1**

inequality formatted correctly with lower and upper bounds **B1**

Answer: 0.805 ≤ x + y < 0.915

Question 8

use upper bounds 2.05, 3.05 and 4.05 **M1**

calculate product 2.05*3.05*4.05 **M1**

V < 25.322625 cm^3 cao **A1**

Answer: V < 25.322625 cm^3. WorkingCheck: 2.05*3.05 = 6.2525; *4.05 = 25.322625, so volume is less than 25.322625.

Question 9

(a) radius to 2 sf 1.2 gives 1.15 ≤ r < 1.25; height to 1 dp 3.4 gives 3.35 ≤ h < 3.45 **M1**

(a) 1.15 ≤ r < 1.25 and 3.35 ≤ h < 3.45 cao **A1**

(a) Answer: Radius: 1.15 ≤ r < 1.25; Height: 3.35 ≤ h < 3.45

(b) substitute lower bounds r=1.15 and h=3.35 into volume formula: V = 3.142 * 1.15^2 * 3.35 **M1**

(b) V = 3.142 * 1.3225 * 3.35 = 13.92 cao to 2 dp **A1**

(b) Answer: 13.92 cm^3

Question 10

(a) use bounds: mass per package lower 245 g, upper 254.999... g; number lower 23.5, upper 24.5 **M1**

(a) total mass between 245 * 23.5 = 5757.5 g and 254.999... * 24.5 = 6247.5 g cao **A1**

(a) Answer: Total mass between 5757.5 g and 6247.5 g.

(b) the mean mass per package is the mass of one package, so 245 ≤ mean < 255 g; every value in this interval is 250 g to the nearest 10 g, so the only possible value is 250 g (the total divided by the number of packages cannot leave this interval) **B1**

(b) Answer: The only possible mean mass to the nearest 10 g is 250 g (the mean lies from 245 g up to 255 g, the bounds for one package).

Question 11

identify lower bounds: length 7.75 ≤ l and width 2.445 ≤ w **M1**

add bounds l_{low} + w_{low} **M1**

double to get perimeter **M1**

perimeter = 20.39 cm cao (to 2 dp) **A1**

Answer: Least possible perimeter = 20.39 cm. WorkingCheck: l_{low} = 7.75, w_{low} = 2.445, sum = 10.195, perimeter = 2*10.195 = 20.39.

Question 12

identify that a/b is minimised by smallest a and largest b, and maximised by largest a and smallest b **M1**

substitute bounds: min = 1.98 / 0.505 and max = 2.02 / 0.495 **M1**

calculate min = 1.98 / 0.505 = 3.920792079... and give 3.92 to 3 s.f. cao **A1**

calculate max = 2.02 / 0.495 = 4.080808081... and give 4.08 to 3 s.f. cao **A1**

state range a/b is between 3.92 and 4.08 inclusive to 3 s.f. oe **B1**

Answer: Minimum a/b = 1.98 / 0.505 = 3.920792... so 3.92 (3 s.f.); Maximum a/b = 2.02 / 0.495 = 4.080808... so 4.08 (3 s.f.). Range: 3.92 to 4.08.

© Revision Library | revisionlibrary.co.uk