3.1 Error Intervals: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the lower bound and upper bound for a number which is 12, correct to the nearest integer, using inequality notation.

(Total for Question 1 is 1 mark)

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2 A length is 250 cm, correct to the nearest 10 cm. State its bounds using inequality notation.

(Total for Question 2 is 1 mark)

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3 A length is given as 3.4 m, correct to 1 decimal place. Give the error interval for this value.

(Total for Question 3 is 1 mark)

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4 A town records its weekly rainfall as 12 mm, correct to the nearest mm.

(a) Write the error interval for the rainfall. **(1)**

.....

(b) State the least possible value of the rainfall. **(1)**

(Total for Question 4 is 2 marks)

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5 The mass of a parcel is 241 kg, correct to the nearest 1 kg.
Rosa says the exact mass could be 241.4 kg. Is Rosa correct? You must show your working.

(Total for Question 5 is 2 marks)

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6 The distance of a journey is 410 km when rounded to 2 significant figures.
Write down the error interval for the distance, using the letter d.

(Total for Question 6 is 3 marks)

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7 A baker uses 250 g of flour (to the nearest 10 g) and 120 g of sugar (to the nearest 10 g). Find the possible range for the total mass of flour and sugar. Give your answer using inequalities.

(Total for Question 7 is 2 marks)

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8 A student writes a measurement as 0.72 correct to 2 decimal places.
Work out the error interval for the true value.

(Total for Question 8 is 2 marks)

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9 A measurement is given as 25 correct to the nearest 5.

(a) Write the error interval for the measurement. **(2)**

.....

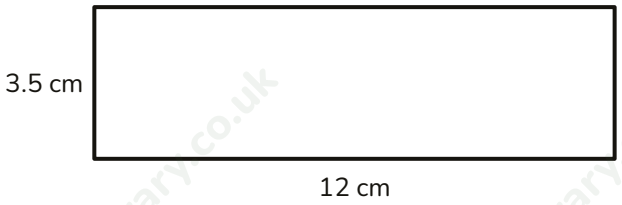
(b) Find the least possible value of half of this measurement. **(2)**

.....

(Total for Question 9 is 4 marks)

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10 A rectangle has length 12 cm, correct to the nearest centimetre, and width 3.5 cm, correct to 1 decimal place. Work out the greatest possible area of the rectangle. Give your answer as an inequality.



(Total for Question 10 is 3 marks)

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11 A length is recorded as 3.6 m, correct to 1 decimal place. Write down the lower and upper bounds of the length.

(Total for Question 11 is 2 marks)

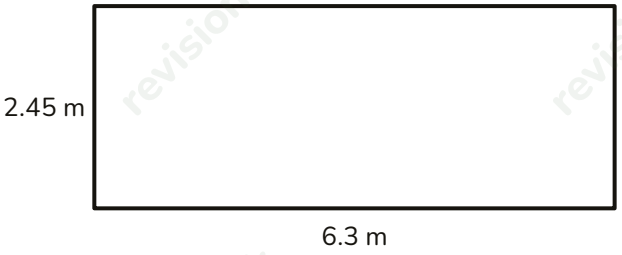
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12 A metal sheet has length 8.02 m correct to 3 significant figures and width 0.450 m correct to 3 significant figures. Find the lower bound for the area of the sheet. Give your answer as an inequality.

(Total for Question 12 is 3 marks)

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13 A rectangle has length 6.3 m correct to 1 decimal place and width 2.45 m correct to 2 decimal places.



(a) Write the error intervals for the length and the width. **(2)**

.....

(b) Work out the greatest possible area. Give your answer to 3 decimal places. **(4)**

.....

(Total for Question 13 is 6 marks)

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14 A booklet has width recorded as 9.8 cm to 1 decimal place and height recorded as 14 cm to the nearest centimetre.
Calculate the minimum possible area of the rectangle formed by these measurements. Give your answer to 3 significant figures.

(Total for Question 14 is 3 marks)

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15 A cylindrical tin has recorded radius 2.4 cm correct to 1 decimal place and recorded height 8.0 cm correct to 1 decimal place. Using bounds, show that the maximum possible volume is less than 155 cm^3.
Take π as π and leave your reasoning in terms of π where helpful.

(Total for Question 15 is 4 marks)

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16 A quantity x is given as x = 4.0 correct to 2 significant figures. A quantity y is given as y = 0.036 correct to 2 significant figures.
Using bounds, find the maximum possible value of x * y. Give your answer in standard form to 2 significant figures.

(Total for Question 16 is 4 marks)

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Mark scheme · 3.1 Error Intervals: Test Pack

Question 1

11.5 ≤ x < 12.5 cao **B1**

Answer: 11.5 ≤ x < 12.5

Question 2

245 ≤ x < 255 cao **B1**

Answer: 245 ≤ x < 255

Question 3

3.35 ≤ x < 3.45 cao **B1**

Answer: 3.35 ≤ x < 3.45

Question 4

(a) 11.5 ≤ x < 12.5 cao **B1**

(a) Answer: 11.5 ≤ x < 12.5

(b) 11.5 cao **B1**

(b) Answer: 11.5

Question 5

limits 240.5 and 241.5 found **M1**

correct conclusion with comparison to the limits **A1**

Answer: Yes

Question 6

identifies the rounding unit as 10 **M1**

lower limit with ≤ **B1**

upper limit with < **B1**

Answer: 405 ≤ d < 415

Question 7

identify bounds: flour 245 ≤ f < 255, sugar 115 ≤ s < 125 **M1**

360 ≤ total < 380 cao **A1**

Answer: 360 ≤ total < 380 g. WorkingCheck: min total 245+115=360, max total <255+125=380.

Question 8

recognise half of last decimal place is 0.005 and set interval 0.72 ± 0.005 **M1**

0.715 ≤ x < 0.725 cao **A1**

Answer: 0.715 ≤ x < 0.725

Question 9

(a) recognise rounding to nearest 5 gives half-interval 2.5 and form 22.5 ≤ x < 27.5 **M1**

(a) 22.5 ≤ x < 27.5 cao **A1**

(a) Answer: 22.5 ≤ x < 27.5

(b) take half of lower bound 22.5 giving 11.25 **M1**

(b) 11.25 cao **A1**

(b) Answer: 11.25

Question 10

use upper bounds: length < 12.5 and width < 3.55 **M1**

multiply upper bounds oe **M1**

area < 44.375 cm² cao **A1**

Answer: area < 44.375 cm^2, since 12.5 * 3.55 = 44.375. WorkingCheck: upper bounds 12.5 and 3.55, 12.5*3.55 = 44.375 so area is less than 44.375.

Question 11

lower bound 3.55 m cao **B1**

upper bound 3.65 m cao (upper bound exclusive) **B1**

Answer: Lower bound 3.55 m, upper bound 3.65 m (upper bound is exclusive).

Question 12

identify lower bounds: 8.015 ≤ L and 0.4495 ≤ W **M1**

multiply lower bounds oe **M1**

area ≥ 3.6027425 m² cao **A1**

Answer: area ≥ 3.6027425 m^2. WorkingCheck: L_{low} = 8.015, W_{low} = 0.4495, product = 8.015*0.4495 = 3.6027425.

Question 13

(a) length interval: 6.25 ≤ L < 6.35 or 6.25 ≤ L < 6.35 (recognise half last dp 0.05) **M1**

(a) 6.25 ≤ L < 6.35 and 2.445 ≤ W < 2.455 cao **A1**

(a) Answer: Length: 6.25 ≤ L < 6.35; Width: 2.445 ≤ W < 2.455

(b) use upper bounds for length and width: 6.35 and 2.455 and multiply **M1**

(b) correct multiplication shown: 6.35 * 2.455 = 15.58925 **M1**

(b) 15.58925 rounded to 3 dp: 15.589 cao **A1**

(b) answer includes correct unit m^2 or stated as square metres **B1**

(b) Answer: 15.589 m^2

Question 14

use lower bounds: width = 9.75 cm and height = 13.5 cm and multiply **M1**

131.625 (intermediate product) oe **A1**

132 to 3 significant figures cao **A1**

Answer: 132 to 3 significant figures (from 9.75 * 13.5 = 131.625).

Question 15

use upper bounds: radius r_upper = 2.45 cm, height h_upper = 8.05 cm and write $V_{max} \leq \pi * (2.45)^2 * 8.05$ **M1**

calculate numeric product $(2.45)^2 * 8.05 = 48.320125$ or show equivalent numeric work **M1**

show $V_{max} = 48.320125\ \pi\ cm^3$ (in exact numeric times π form) oe **A1**

compare with 155 by evaluating numerically or noting 48.320125 * 3.1416 is approximately 151.8 and conclude $V_{max} < 155$ cao **A1**

Answer: Upper bound volume $V_{max} = \pi * (2.45)^2 * 8.05 = 48.320125\ \pi$; numerically this is approximately 151.8 cm^3, so V < 155 cm^3.

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Question 16

identify upper bounds: x_upper = 4.05 and y_upper = 0.0365	**M1**
multiply upper bounds: 4.05 * 0.0365 = 0.147825	**M1**
convert to standard form $1.47825 * 10^{-1}$ oe	**A1**
round to 2 significant figures $1.5 * 10^{-1}$ cao	**A1**

Answer: $1.5 * 10^{-1}$

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