3.3 Estimating: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Round 47 to 1 significant figure.

(Total for Question 1 is 1 mark)

2 Estimate 47 + 86 + 392 by rounding each number to 1 significant figure, then adding.

(Total for Question 2 is 2 marks)

3 Write down the upper and lower bounds for the measurement 12 cm to the nearest centimetre.

(a) Lower bound **(1)**

.....

(b) Upper bound **(1)**

.....

(Total for Question 3 is 2 marks)

4 Tom uses his calculator to work out 68 x 297. His calculator shows 2019.6. Use estimation to determine whether Tom's answer is correct, and give an estimate for the correct answer.

(Total for Question 4 is 3 marks)

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5 By rounding each number to 1 significant figure, put a ring around the best estimate for 0.0038 x 512

- ☐ A) 2
- ☐ B) 0.2
- ☐ C) 20
- ☐ D) 200

(Total for Question 5 is 2 marks)

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6 Estimate the value of $\sqrt{218 \times 224}$
You must show your rounding.

(Total for Question 6 is 3 marks)

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7 Estimate the value of $\sqrt{6.97 \times 727}$
You must show your rounding.

(Total for Question 7 is 3 marks)

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8 By rounding each number to 1 significant figure, work out an estimate for 411 x 0.52

(Total for Question 8 is 2 marks)

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9 Estimate 298 + 127 by rounding each number to 1 significant figure before adding.

(Total for Question 9 is 2 marks)

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10 Explain why rounding 148 to 1 significant figure gives 100, and not 150.

(Total for Question 10 is 2 marks)

11 Round each number to 1 significant figure then work out the sum.
7.8 + 0.64 + 12.3

(Total for Question 11 is 2 marks)

12 A caterer is planning a wedding for 187 guests. Each guest is served a three-course meal costing £9.80 for the starter, £18.60 for the main course and £6.40 for the dessert. The caterer also charges a fixed service fee of £480. By rounding suitable values to 1 significant figure, estimate the total amount the caterer will charge.

(Total for Question 12 is 4 marks)

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13 Stretch question. A gardener needs to buy soil. Bags are labelled 18.6 kg. He plans to buy 9 bags. He estimates using upper and lower bounds for one bag to give a range for the total mass of soil he will have. Work out the lower and upper bounds for the total mass of 9 bags, giving your answers to 3 significant figures where appropriate. Show your working clearly.

(a) Write the lower and upper bounds for one bag labelled 18.6 kg to the nearest 0.1 kg. **(2)**

.....

(b) Find the lower bound for the total mass of 9 bags. Give your answer to 3 significant figures. **(3)**

.....

(c) Find the upper bound for the total mass of 9 bags. Give your answer to 3 significant figures. **(3)**

.....

(Total for Question 13 is 8 marks)

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14 Give an estimate for 47 x 0.98 by rounding one or both numbers and show your working.

(Total for Question 14 is 2 marks)

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15 Show that 6.02×10^4 is approximately equal to 6.0×10^4 to 2 significant figures. Explain whether it is acceptable to use 6.0×10^4 as an estimate when calculating a value to 2 significant figures.

(Total for Question 15 is 3 marks)

16 A student measures the length of a metal rod as 124.5 mm, correct to the nearest 0.5 mm. Give the upper and lower bounds for the measurement and hence estimate the maximum possible percentage error in the measurement (give your answer to 2 significant figures).

(Total for Question 16 is 4 marks)

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Mark scheme · 3.3 Estimating: Test Pack

Question 1

50 cao **B1**

Answer: 50 (to 1 s.f.)

Question 2

round 47->50, 86->90, 392->400 and set up the addition oe **M1**

540 cao **A1**

Answer: 540

Question 3

(a) 11.5 cm oe **B1**

(a) Answer: 11.5 cm

(b) 12.5 cm oe **B1**

(b) Answer: 12.5 cm

Question 4

rounding both values to 1 sf, 70 and 300 **M1**

dep, 70 x 300 = 21000 **M1**

correct conclusion with reason, e.g. 2019.6 is not close to the estimate of 21000 (about 10 times too small), so Tom's answer is wrong, ft their estimate **B1**

Answer: Estimate = 21000; Tom's answer of 2019.6 is wrong (probably a misplaced decimal point).

Question 5

rounding both values to 1 sf, 0.004 and 500 **M1**

A (2) cao **A1**

Answer: A) 2

Question 6

rounds both numbers to 1 significant figure **M1**

product 40000 **M1**

200 cao **A1**

Answer: 200

Question 7

rounds both numbers to 1 significant figure **M1**

product 4900 **M1**

70 cao **A1**

Answer: 70

Question 8

rounding both values to 1 sf, 400 and 0.5 **M1**

200 cao **A1**

Answer: 200

Question 9

round 298 -> 300 and 127 -> 100 or state both rounded values **M1**

400 cao **A1**

Answer: 400. Working: 298 -> 300, 127 -> 100, 300 + 100 = 400. Check: rounded values 300 and 100 sum to 400.

Question 10

identifying that the first significant figure is the hundreds digit, 1, and all following digits become 0 for 1 sf **B1**

correct reasoning that the next digit (4, the tens digit) is less than 5, so the 1 is not rounded up, giving 100; 150 is not a rounding to 1 significant figure **B1**

Answer: 100, because the first significant figure (1) is followed by a 4, which is less than 5, so it rounds down; 150 has two significant figures, not one.

Question 11

round each number to 1 sf: 7.8 -> 8, 0.64 -> 0.6, 12.3 -> 10 **M1**

sum = 18.6 cao **A1**

Answer:18.6

(8 + 0.6 + 10 = 18.6)

Question 12

finding the cost per guest, 9.80 + 18.60 + 6.40 = 34.80 **M1**

rounding to 1 sf: 34.80 to 30, 187 to 200, and 480 to 500 **M1**

dep, (30 x 200) + 500 **M1**

6500 (pounds), awrt 6500 **A1**

Answer: £6500

Question 13

(a) lower bound 18.55 kg oe **B1**

(a) upper bound 18.65 kg oe **B1**

(a) Answer: Lower bound (one bag) = 18.55 kg, Upper bound (one bag) = 18.65 kg

(b) multiply lower bound for one bag by 9 **M1**

(b) show calculation 18.55 × 9 = 166.95 **M1**

(b) 167 kg awrt to 3 sf **A1**

(b) Answer: Lower bound total = 166.95 kg -> 167 kg to 3 sf

(c) multiply upper bound for one bag by 9 **M1**

(c) show calculation 18.65 × 9 = 167.85 **M1**

(c) 168 kg awrt to 3 sf **A1**

(c) Answer: Upper bound total = 167.85 kg -> 168 kg to 3 sf

Question 14

use a sensible rounding method, e.g. 47 ~ 50 or 0.98 ~ 1 or both **M1**

give an estimated product with working, e.g. 50 x 1 = 50 or 47 x 1 = 47 (accept 49 from 50 x 0.98) cao **A1**

Answer:50

(example: 47 ~ 50 and 0.98 ~ 1, 50 x 1 = 50)

Question 15

round 6.02 to 2 sf giving 6.0 **M1**

state $6.02 \times 10^4 \sim 6.0 \times 10^4$ cao **A1**

give an explanation about acceptability: yes because rounding to 2 sf preserves required precision or note relative error is small oe **B1**

Answer:6.0×10^4

(6.02 rounded to 2 sf is 6.0, so $6.02 \times 10^4 \sim 6.0 \times 10^4$. It is acceptable to use 6.0×10^4 for estimates to 2 sf since the value is within the rounding error.)

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Question 16

give lower and upper bounds: 124.25 mm and 124.75 mm (or state 124.25 ≤ L < 124.75)	**M1**
state the absolute max error is 0.25 mm	**M1**
calculate percentage error = (0.25 / 124.5) x 100	**M1**
final percentage error 0.20% awrt to 2 sf cao	**A1**

Answer: Lower bound 124.25 mm, upper bound 124.75 mm. Maximum percentage error = 0.20% (0.25/124.5 x 100 = 0.201% -> 0.20% to 2 sf).

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