FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

N16: Bounds

Reason about upper and lower bounds

20 marks · 25 minutes · Calculator allowed

1) A length is 7.6 cm to 1 decimal place. Explain why 7.65 cm is used as the upper bound, even though the length must be less than 7.65 cm.

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[Question 1: 1 marks]

2) A rectangle is 8 cm by 5 cm, each to the nearest cm. Show that the greatest possible area is 46.75 cm^2.

[Question 2: 2 marks]

3) a and b are rounded values. To find the upper bound of $a - b$, which bounds of a and b should you use? Explain.

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[Question 3: 2 marks]

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4) A runner runs 100 m (to the nearest metre) in 9.8 s (to the nearest 0.1 s). Show that the upper bound of her speed is 10.31 m/s to 2 decimal places.

[Question 4: 2 marks]

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5) A lift can carry at most 300 kg. Twelve boxes each have mass 25 kg, to the nearest kg. Can you be sure the lift can carry all twelve boxes? Explain.

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[Question 5: 3 marks]

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6) $x = 4.7$ and $y = 2.3$, both to 1 decimal place. Amy says the upper bound of $\frac{x}{y}$ is $\frac{4.75}{2.35}$. Explain her mistake.

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[Question 6: 2 marks]

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7) A square has area $30\,cm^2$ to the nearest cm^2. Show that the lower bound of its side length is 5.43 cm to 2 decimal places.

[Question 7: 2 marks]

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8) The lower bound of a value is 6.73 and the upper bound is 6.81. Can you give the value correct to 1 decimal place? What is the most accurate value you can give? Explain.

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[Question 8: 3 marks]

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9) A triangle has sides 5 cm, 6 cm and 7 cm, each to the nearest cm. Show that the lower bound of its perimeter is 16.5 cm.

[Question 9: 2 marks]

10) Why is the upper bound of 3.2 (to 1 d.p.) written as 3.25 and not 3.249?

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[Question 10: 1 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Explanation	It is the boundary value; no largest number below 7.65 exists (C1).
2	Shown	8.5×5.5 (M1); 46.75 (C1).
3	UB a and LB b	Largest minus smallest (C1); gives the biggest difference (C1).
4	Shown	$100.5 \div 9.75$ (M1); 10.31 (C1).
5	No	UB $12 \times 25.5 = 306$ (M1); $306 > 300$ (M1); not certain (C1).
6	Use LB of y	Dividing by a smaller number gives a larger answer (C1); $\frac{4.75}{2.25}$ (B1).
7	Shown	$\sqrt{29.5}$ (M1); 5.43 (C1).
8	No; 7 to 1 s.f.	6.7 and 6.8 differ at 1 d.p. (M1); both round to 7 (M1); explanation (C1).
9	Shown	4.5 + 5.5 + 6.5 (M1); 16.5 (C1).
10	Explanation	Numbers like 3.2499 also round to 3.2, so the boundary is 3.25 (C1).