

Rounding, estimation and error intervals

Foundation and Higher tiers | Total marks: 61

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Rounding whole numbers	N15	Foundation	1	No	2
2	Rounding to 1 decimal place	N15	Foundation	2	No	1
3	Decimal places and significant figures	N15	Foundation	3	No	3
4	Significant figures with zeros	N15	Foundation	3	No	2
5	Estimating a calculation	N14	Foundation	4	No	2
6	Estimating in context	N14 G16	Foundation	4	No	3
7	Error interval from rounding	N15	Common	4	No	2
8	Least and greatest values of a rounded count	N15	Common	4	No	2
9	Estimating with powers and roots, and over or under	N14	Foundation	5	No	3
10	Error interval from truncation	N15	Common	5	No	2
11	Comparing error intervals	N15	Common	5	No	2
12	Rounding a calculator answer in context	N15 N2	Foundation	2	Yes	2
13	Using a calculator, then rounding to significant figures	N15 N3	Foundation	2	Yes	3
14	Rounding a calculator answer to the nearest thousand	N15 N2	Foundation	2	Yes	2
15	Rounding calculator answers to 1 decimal place	N15	Foundation	2	Yes	2
16	Rounding a decimal product	N15 N2	Foundation	2	Yes	2

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	Rounding a calculator answer	N15 G16	Foundation	3	Yes	2
18	Rounding money in context	N15 N2	Foundation	3	Yes	3
19	Checking a rounded calculator answer	N15	Foundation	3	Yes	2
20	Rounding a large calculator answer to significant figures	N15 N13	Foundation	3	Yes	3
21	Converting time, rounding to decimal places	N15 N13	Foundation	3	Yes	3
22	Units and significant figures	N15 N13	Foundation	3	Yes	3
23	Rounding up in context	N15 N2 N13	Foundation	3	Yes	3
24	Estimating a bill, then working it out exactly	N14 N2	Foundation	3	Yes	4
25	Checking a calculation by estimating	N14	Foundation	4	Yes	3
	Total					61

Question 1 N15 · Foundation · Grade 1 · 2 marks

Q	Answer	Mark	Comments
1(a)	38 000	B1	
1(b)	38 460	B1	

Question 2 N15 · Foundation · Grade 2 · 1 mark

Q	Answer	Mark	Comments
2	5.26	B1	

Question 3 N15 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
3(a)	7.10	B1	not 7.1
3(b)	0.047	B1	
3(c)	60 000	B1	

Question 4 N15 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
4(a)	the zeros before the 3 are not significant	B1	oe, such as he rounded to 3 decimal places, or 0.031 has only 2 significant figures
4(b)	0.0306	B1	

Question 5 N14 · Foundation · Grade 4 · 2 marks

Q	Answer	Mark	Comments
5	$\frac{60-20}{0.2}$ or $\frac{40}{0.2}$	M1	oe, at least two of the three numbers rounded to 1 significant figure
	200	A1	from $\frac{60-20}{0.2}$

Question 6 N14 G16 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
6	at least two of 6, 5 and 1 used	M1	6.1, 4.85 and 0.98 rounded to 1 significant figure
	$6 \times 5 \div 1$	M1	oe, ft their rounding
	30	A1	from $6 \times 5 \div 1$ (or $6 \times 5 = 30$)

Question 7 N15 · Common · Grade 4 · 2 marks

Q	Answer	Mark	Comments
7	$14.55 \leq L < 14.65$	B2	B1 for one correct end

Question 8 N15 · Common · Grade 4 · 2 marks

Q	Answer	Mark	Comments
8(a)	235	B1	
8(b)	244	B1	not 245 or 244.9

Question 9 N14 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
9(a)	7^2 and $\sqrt{25}$, or 49 and 5	M1	oe
	245	A1	
9(b)	overestimate, with a reason	B1	such as 6.8 and 24.6 were both rounded up

Question 10 N15 · Common · Grade 5 · 2 marks

Q	Answer	Mark	Comments
10(a)	he has used rounding, not truncation	B1	oe, such as 6.38 truncates to 6.3 but is not in his interval
10(b)	$6.3 \leq x < 6.4$	B1	

Question 11 N15 · Common · Grade 5 · 2 marks

Q	Answer	Mark	Comments
11	1.65 m or 165 cm, or 162.5 cm	M1	oe, an end of either interval
	Yes with 165 and 162.5 compared	A1	oe, or an example such as Ella 164 cm and Jack 162 cm

Question 12 N15 N2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
12	$438 \div 61.7$ or 7.098...	M1	oe
	7.1	A1	not 7.09 or 7.10

Question 13 N15 N3 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
13(a)	33.9889 or 9.56 seen	M1	
	3.555324268	A1	accept 3.5553... (at least 4 decimal places, cut or rounded)
13(b)	3.6	B1ft	ft their (a)

Question 14 N15 N2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
14	1368×18.5 or 25 308	M1	
	25 000	A1	

Question 15 N15 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
15	$\sqrt{22}$, 2.17^2 , $\frac{33}{7}$ only	B2	B1 for two correct and at most one wrong

Question 16 N15 N2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
16	0.18×23.6 or 4.248	M1	oe
	4.2	A1	

Question 17 N15 G16 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
17	84.6×57.3 or 4847.58	M1	
	4850	A1	

Question 18 N15 N2 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
18(a)	$250 \div 6$ or 41.66...	M1	oe
	£41.67	A1	not 41.66 or 41.7
18(b)	$6 \times 41.67 = 250.02$, which is more than 250	B1ft	oe, such as the amount was rounded up so there is not enough. ft their (a) if rounded up

Question 19 N15 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
19	113.8...	M1	accept [113.8, 113.9]
	No with 110	A1	

Question 20 N15 N13 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
20	8.3×60 or 498	M1	
	$299\,792 \times$ their 498 or 149 296 416	M1	oe
	149 000 000	A1	

Question 21 N15 N13 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
21(a)	there are 60 minutes in an hour, not 100	B1	oe, such as 0.17 hours is 10.2 minutes, or 17 minutes is $\frac{17}{60}$ of an hour
21(b)	$137 \div 60$ or 2.283...	M1	oe, or $2 + 17 \div 60$
	2.28	A1	

Question 22 N15 N13 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
22	0.094×480 or 45.12	M1	oe
	their $45.12 \div 10$ or 4.512	M1	oe
	4.5	A1	

Question 23 N15 N2 N13 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
23(a)	28×175 or 4900, and their $4900 \div 1500$ or 3.26...	M1	oe, such as $4.9 \div 1.5$, or 1500s added until at least 4900
	4	A1	not 3 or 3.26...
23(b)	1100	B1ft	ft $1500 \times$ their (a) – 4900 when their (a) is a whole number more than 3.26...

Question 24 N14 N2 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
24(a)	4, 12 and 1 used	M1	oe, such as $7 \times 4 + 4 \times 12$
	£78	A1	
24(b)	£77.79	B1	
24(c)	more, with a reason	B1	oe, such as 3.89 was rounded up by 11p seven times, but 12.15 was rounded down by only 15p four times

Question 25 N14 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
25(a)	$20 \times 0.4 \div 4$	M1	oe, at least two numbers rounded to 1 significant figure
	2 and a conclusion	A1	oe, such as the answer should be about 2, not 21
25(b)	2.10	B1	2.10 only: the rounding is part of the answer