3.3 Estimating: 2-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 120 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A school buys 16 notebooks. Each one costs £3.81.

(a) Estimate the total cost by rounding each number to 1 significant figure.

(b) State whether your estimate is an over-estimate or an under-estimate. Give a reason.

(Total for Question 1 is 3 marks)

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2 Estimate the value of $\sqrt{76.3 \times 22.8}$

You must show your rounding.

(Total for Question 2 is 3 marks)

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3 A school buys 41 notebooks. Each one costs £8.12.

(a) Estimate the total cost by rounding each number to 1 significant figure.

(b) State whether your estimate is an over-estimate or an under-estimate. Give a reason.

(Total for Question 3 is 3 marks)

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4 By rounding each number to 1 significant figure, work out an estimate for (39.4 + 58.9) / 9.7

(Total for Question 4 is 3 marks)

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5 Nadia buys 48.6 litres of petrol at £3.15 per litre. By rounding each number to 1 significant figure, estimate the total cost.

(Total for Question 5 is 2 marks)

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6 Without using a calculator, estimate the value of $\sqrt{146}$. Show working to support your answer.

(Total for Question 6 is 2 marks)

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7 Estimate 12.7 × 3.9 by rounding each number to 1 significant figure, then multiply.

(Total for Question 7 is 2 marks)

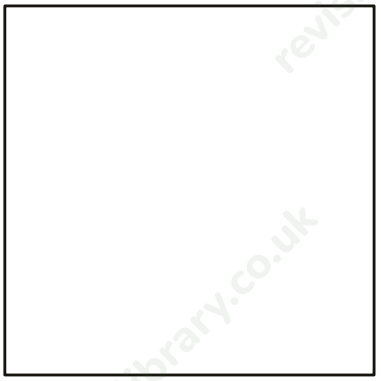
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8 Estimate 0.049 ÷ 0.012 to 1 significant figure. Show your rounding and the calculation.

(Total for Question 8 is 2 marks)

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9 A square rug has side length 4.8 m. Estimate the area by rounding the side to 1 significant figure, and state whether your estimate is an over-estimate or an under-estimate of the exact area.



(Total for Question 9 is 2 marks)

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10 Estimate 6.37×4.9 by rounding each number to 1 significant figure.

(Total for Question 10 is 2 marks)

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11 A small shop sells jars of jam priced at £2.49 each. A customer buys 8 jars. Use rounding to estimate the total cost. State your rounded price and the estimated total.

(a) Rounded price used **(1)**

(b) Estimated total cost **(2)**

(Total for Question 11 is 3 marks)

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12 By rounding each number to 1 significant figure, estimate the value of 82 x 53. State, giving a reason, whether your estimate is an overestimate or an underestimate of the exact answer.

(Total for Question 12 is 3 marks)

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13 By rounding suitable values to 1 significant figure, estimate the value of $58.7^2 / \sqrt{83}$

(Total for Question 13 is 4 marks)

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14 By rounding each number to 1 significant figure, estimate the value of $(6.9 \times 10^3) \times (3.8 \times 10^{-5})$. Give your answer in standard form.

(Total for Question 14 is 3 marks)

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15 A bakery uses 18.7 g of yeast for each loaf. They bake 320 loaves. Use 1 significant figure to estimate the total mass of yeast used and state whether this estimate is an over-estimate or an under-estimate.

(Total for Question 15 is 3 marks)

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16 Estimate 246 × 78 by rounding each number to 1 significant figure before multiplying.

(Total for Question 16 is 2 marks)

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17 Estimate 5325 ÷ 18 by rounding each number to 1 significant figure before dividing.

(Total for Question 17 is 2 marks)

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18 A model car travels at 14.6 m/s for 3.2 s. Estimate the distance travelled by rounding both values to 1 significant figure. Say whether your estimate is likely to be an over-estimate or an under-estimate.

(Total for Question 18 is 3 marks)

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19 A delivery van has load mass 1270 kg. Each parcel has mass about 3.6 kg. Using 1 significant figure for each value, estimate how many parcels the van could carry.

(Total for Question 19 is 3 marks)

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20 A delivery van travels 47.6 km, then 32.9 km, then 19.8 km. Estimate the total distance by rounding each distance to the nearest 10 km before adding.

(Total for Question 20 is 3 marks)

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21 Estimate the value of 83 ÷ 4.1 by rounding the divisor to 1 significant figure and carrying out the division. Show the rounded divisor you use.

(a) Rounded divisor used **(1)**

.....

(b) Estimated quotient **(3)**

(Total for Question 21 is 4 marks)

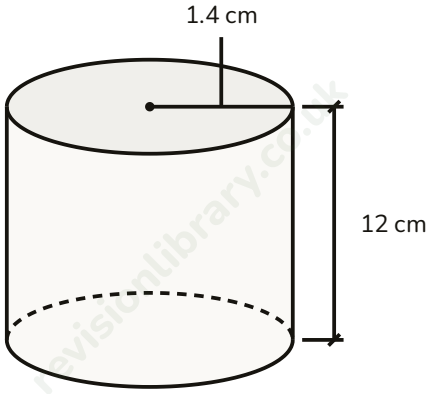
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22 A recipe needs 0.345 kg of flour for one batch. Estimate how much flour is needed for 12 batches by rounding the quantity for one batch to 1 significant figure first.

(Total for Question 22 is 3 marks)

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23 A small cylinder has radius 1.4 cm and height 12 cm. Estimate its volume to 1 significant figure for each measurement. Give your estimate (to 3 significant figures where appropriate) and say whether it is an over- or under-estimate.



(Total for Question 23 is 3 marks)

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24 The prices of three dishes are £4.95, £12.40 and £23.80. Estimate the total cost by rounding each price to 1 significant figure. Give your estimate and explain whether it is likely to be an over-estimate or an under-estimate.

(Total for Question 24 is 4 marks)

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25 A large cylindrical water tank has radius 3.6 m and height 8.4 m. Estimate the volume using 1 significant figure for radius and height. State whether your estimate is an over-estimate or an under-estimate.

(Total for Question 25 is 3 marks)

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26 Three wooden boards measure 4.12 m, 6.89 m and 5.47 m. Using 1 significant figure for each length, estimate the total length required and decide how many 5 m rolls of material the builder should buy. Show your working.

(Total for Question 26 is 4 marks)

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27 A school orders 156 exercise books priced at 1.95 each. The finance team decide to estimate the total cost by rounding the price to the nearest whole pound and rounding the number of books to 2 significant figures. Give the estimated cost.

(a) Rounded price and rounded number of books used **(2)**

.....

(b) Estimated total cost **(2)**

(Total for Question 27 is 4 marks)

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28 You have three measurements: 4.87 m, 5.12 m and 4.95 m. Use appropriate rounding to estimate the mean (average) of these three measurements. State your rounding and your estimated mean.

(a) State the rounded values you will use **(2)**

.....

(b) Calculate the estimated mean using your rounded values **(4)**

.....

(Total for Question 28 is 6 marks)

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29 Estimate the value of $\sqrt{198}$ to the nearest whole number. Show your method.

(Total for Question 29 is 2 marks)

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30 A recipe needs 0.375 kg of flour per batch. A chef will make 28 batches. Use an appropriate rounding to estimate the total mass of flour needed in kg and state why your rounding is suitable.

(Total for Question 30 is 3 marks)

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Mark scheme · 3.3 Estimating: 2-hour Pack

Question 1

rounds both values to 1 significant figure	M1
£80	A1
over-estimate because both numbers were rounded up	B1

Answer: £80, over-estimate

Question 2

rounds both numbers to 1 significant figure	M1
product 1600	M1
40 cao	A1

Answer: 40

Question 3

rounds both values to 1 significant figure	M1
£320	A1
under-estimate because both numbers were rounded down	B1

Answer: £320, under-estimate

Question 4

rounding all three values to 1 sf: 40, 60 and 10	M1
dep, (40 + 60) / 10 with correct order of operations	M1
10 cao	A1

Answer: 10

Question 5

rounding both values to 1 sf, 50 and 3	M1
150 (£150) cao	A1

Answer: £150

Question 6

identifying $144 = 12^2$ (or $144 < 146 < 169$) as the nearest square number	M1
12 (accept 12.0 to 12.2 oe)	A1

Answer: 12

Question 7

round 12.7->10 and 3.9->4 and multiply oe	M1
40 cao	A1

Answer: 40

Question 8

round 0.049->0.05 and 0.012->0.01 and set up division oe	M1
5 cao	A1

Answer: 5

Question 9

round 4.8->5 and calculate area 5 × 5 oe	M1
25 and over-estimate cao	A1

Answer: Estimated area = 25 m^2; this is an over-estimate

Question 10

round 6.37 -> 6 and 4.9 -> 5 or equivalent 1 sf rounding	M1
30 cao	A1

Answer: 30. Working: 6.37 -> 6, 4.9 -> 5, 6 × 5 = 30. Check: product 30.

Question 11

(a) 2.5 (accept 2 or another sensible rounded price)	B1

(a) Answer: 2.5

(b) multiply rounded price by 8, e.g. 2.5 × 8	M1
(b) £20 (or the correct total for the rounded price used, e.g. £16 from £2)	A1

(b) Answer: £20.00

Question 12

rounding both values to 1 sf, 80 and 50	M1
4000 cao	A1
underestimate, with reason that both 82 and 53 were rounded down, so the estimate is smaller than the exact answer	B1

Answer: 4000; underestimate

Question 13

rounding 58.7 to 60 and squaring, $60^2 = 3600$	M1
identifying $81 = 9^2$ as the nearest square number to 83, so $\sqrt{83}$ is approximately 9	M1
dep, 3600 / 9	M1
400 cao	A1

Answer: 400

Question 14

rounding both values to 1 sf, 7 and 4	M1
dep, $7 \times 4 = 28$ with powers of 10 combined, $10^3 \times 10^{-5} = 10^{-2}$	M1
2.8×10^{-1} cao (accept 0.28)	A1

Answer: 2.8×10^{-1}

Question 15

round 18.7->20 g and 320->300 to 1 s.f.	M1
multiply 20 × 300 = 6000 g	M1
6000 g cao; over-estimate (6000 > exact 5984 g) oe	A1

Answer: 6000 g (6.0 kg), over-estimate

Question 16

round 246->200 and 78->80 to 1 s.f. and multiply oe	M1
16000 cao	A1

Answer: 16000

Question 17

round 5325->5000 and 18->20 to 1 s.f. and divide oe	M1
250 cao	A1

Answer: 250

Question 18

round 14.6->10 and 3.2->3 to 1 s.f.	M1
multiply 10 × 3 = 30 oe	M1
30 m cao; under-estimate	A1

Answer: 30 m; under-estimate

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Question 19

round total mass 1270->1000 to 1 s.f. **M1**

round parcel mass 3.6->4 to 1 s.f. and divide 1000/4 oe **M1**

250 cao **A1**

Answer: 250 parcels

Question 20

round 47.6 -> 50, 32.9 -> 30, 19.8 -> 20 or state rounded values **M1**

add rounded values **M1**

100 km cao **A1**

Answer: 100 km. Working: 47.6 -> 50, 32.9 -> 30, 19.8 -> 20; 50 + 30 + 20 = 100. Check: exact total 100.3 km so estimate 100 km is sensible.

Question 21

(a) 4.0 oe **B1**

(a) Answer: 4.0

(b) divide 83 by rounded divisor 4.0 or equivalent method **M1**

(b) show calculation 83 ÷ 4 = 20.75 or state intermediate **M1**

(b) 20.8 awrt or 21 oe **A1**

(b) Answer: Approximately 20.8 (using 4.0). Working: 83 ÷ 4.0 = 20.75 so estimate 20.8 or 21. Check: exact 83 ÷ 4.1 = 20.244..., using 4 gives 20.75 so 20.8 awrt is acceptable.

Question 22

round 0.345 to 0.3 (1 significant figure) **M1**

multiply rounded amount by 12 **M1**

3.6 kg cao **A1**

Answer: Using 1 significant figure: 0.345 -> 0.3 so 0.3 × 12 = 3.6 kg (estimate). Check: exact 0.345 × 12 = 4.14 kg, so 3.6 is the estimate when rounding to 1 sf.

Question 23

round radius 1.4->1 and height 12->10 to 1 s.f. **M1**

use $V = \pi r^2 h$ and substitute to give $V = \pi \times 1^2 \times 10 = 10\pi$ **M1**

31.4 cm^3 awrt and under-estimate cao **A1**

Answer: Approximately 31.4 cm^3 (under-estimate)

Question 24

round 4.95->5, 12.40->10, 23.80->20 to 1 s.f. **M1**

add the rounded values 5 + 10 + 20 **M1**

state whether under/over with reason, e.g. two numbers were rounded down and one up so total is likely down **M1**

£35 cao **A1**

Answer: £35; under-estimate (net rounding down)

Question 25

round radius 3.6->4 and height 8.4->8 to 1 s.f. **M1**

substitute into $V = \pi r^2 h$ to give $V = \pi \times 4^2 \times 8 = 128\pi$ **M1**

402.1 m^3 awrt; over-estimate cao **A1**

Answer: Approximately 402.1 m^3; over-estimate

Question 26

round 4.12->4, 6.89->7, 5.47->5 to 1 s.f. **M1**

add rounded lengths 4 + 7 + 5 = 16 m **M1**

divide by roll length 16/5 = 3.2 and use correct method to find number of rolls **M1**

4 rolls cao **A1**

Answer: Estimated total 16 m, so 4 rolls

Question 27

(a) price rounded to £2.00 cao **B1**

(a) 156 to 2 sf = 160 oe **B1**

(a) Answer: Price = £2.00, Number = 160

(b) multiply rounded values 2 × 160 **M1**

(b) £320 cao **A1**

(b) Answer: £320

Question 28

(a) round values to 1 dp or 1 sf given a clear choice (eg 4.9, 5.1, 5.0) **B1**

(a) state the chosen rounded numbers explicitly **B1**

(a) Answer: Use 4.9, 5.1 and 5.0 (rounded to 1 dp).

(b) add the rounded values correctly **M1**

(b) divide the sum by 3 or show method to find mean **M1**

(b) 4.999... oe or 5.0 awrt **A1**

(b) allow 5.0 cao as final rounded estimate **B1**

(b) Answer: Estimated mean = 5.0. Working: 4.9 + 5.1 + 5.0 = 15.0; 15.0 ÷ 3 = 5.0.

Question 29

identify nearest square or use rounding: note $\sqrt{196} = 14$ or 198 ~ 200 **M1**

estimate 14 to the nearest whole number cao **A1**

Answer:14

(using $\sqrt{196} = 14$ or 198 ~ 200 so sqrt ~ $\sqrt{200}$ ~ 14 to the nearest whole number)

Question 30

choose a sensible rounding, e.g. 0.375 ~ 0.38 or 0.375 ~ 0.4 and state reason **M1**

multiply rounded value by 28 (method shown) **M1**

final estimate with reason, e.g. 0.4 x 28 = 11.2 kg with explanation that rounding up ensures enough flour cao **A1**

Answer:11.2 kg

(using 0.375 ~ 0.4; 0.4 x 28 = 11.2 kg. Rounding up ensures the chef has enough flour.)

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