Answers for SET 1

1. 4560

2. 317.30

3. 7500

4. 824

5. 1398.51

6. 2900

7. 610

8. 9581

9. 4264.21

10. 6050

11. 3899.73

12. 1900

13. 7220

14. 4004.88

15. 2547.49

16. 9200

17. 1129

18. 2651

19. 1510

20. 2307

21. 4200

22. 7200

23. 889.25

24. 3192.98

25. 4000

26. 250 (Estimate: 190 + 60)

27. 250 (Estimate: 130 + 120)

28. 10600 (Estimate: 160 × 67)

29. 13 (Estimate: 290 ÷ 23)

30. 12000 (Estimate: 400 × 30)

31. 200 (Estimate: 150 + 50)

32. 6500 (Estimate: 130 × 50)

33. 18 (Estimate: 430 ÷ 24)

34. 240 (Estimate: 270 – 30)

35. 5200 (Estimate: 170 × 30)

36. 160 (Estimate: 120 + 40)

37. 16400 (Estimate: 400 × 40)

38. 200 (Estimate: 260 – 60)

39. 19 (Estimate: 430 ÷ 23)

40. 240 (Estimate: 220 + 20)

41. Lower bound: 8445, Upper bound: 8455

42. Lower bound: 7760, Upper bound: 7860

43. Lower bound: 578.5, Upper bound: 579.5

44. Lower bound: 4117.85, Upper bound: 4117.95

45. Lower bound: 5412, Upper bound: 5422

46. Lower bound: 1261.35, Upper bound: 1261.45

47. Lower bound: 1461, Upper bound: 1561

48. Lower bound: 2583.75, Upper bound: 2583.85

49. Lower bound: 8045, Upper bound: 8055

50. Lower bound: 871.75, Upper bound: 871.85

SET 2 Answers

1. 0.039

2. 9880

3. 3.5

4. 0.0912

5. 500,000

6. 179.7

7. 46,000

8. 0.27

9. 51.009

10. 0.0087

11. 4209.1

12. 0.123

13. 679.00

14. 0.500

15. Lower: 97.75, Upper: 97.85

16. Lower: 651.5, Upper: 652.5

17. Lower: 3247.5, Upper: 3347.5

18. Lower: 9.7325, Upper: 9.7335

19. Lower: 0.00385, Upper: 0.00395

20. $(6 \times 0.8) \div 20 = 4.8 \div 20 = 0.24$

21. $(100 + 50) \times 3 = 150 \times 3 = 450$

22. $(0.05 \times 200) \div 5 = 10 \div 5 = 2$

23. $(8 - 3) \times 10 = 5 \times 10 = 50$

24. $(70 \div 10) + 4 = 7 + 4 = 11$

25. Closest squares: 169 and 196 → $\sqrt{169} = 13$, $\sqrt{196} = 14$. So estimate ≈ 13.4

26. Closest cubes: 512 and 729 → $\sqrt[3]{512} = 8$, $\sqrt[3]{729} = 9$. So estimate ≈ 8.4

27. Lower: 5.835 m, Upper: 5.845 m

28. Lower: 422 g, Upper: 432 g

29. $0.72945 \leq$ value < 0.72955

30. a: 3.25 max, b: 4.75 max, sum: 8.00

31. c: 6.45 min, d: 2.15 max, diff: 4.30

32. $1.425 \leq$ mass < 1.435 kg

33. Max: $12.05 \times 7.35 = 88.5675$ cm^2

34. Min: $25.85 \div 4.85 \approx 5.33$

35. Using 7 instead of 6.7, so it's an overestimate.

36. Using 4 instead of 4.47, so it's an underestimate.

37. Single-sig-fig rounding reduces accuracy—final result is only accurate to one significant figure.

38. $(18 + 9) \div (0.1 \times 9) = 27 \div 0.9 = 30$

39. $200 \times £0.90 = £180$

40. $40 - 10 + 8 = 38$

41. 2.425 m $\leq$ length < 2.435 m

42. $620 \leq$ mass < 625 g

43. $7.415 \leq$ value < 7.425

44. Lower: 142.61, Upper: 142.71 cm² (approximate, see how the limits affect area)

45. 3.285 ≤ value < 3.295

46. 15 × 3 ÷ 0.5 = 45 ÷ 0.5 = 90

47. 0.7 ÷ 0.06 × 9 = 11.7 × 9 = 105.3

48. 8100 ÷ 40 = 202.5

49. 40 × 0.2 = 8 kg

50. Each side: 38.80 ÷ 4 = 9.70 cm, so lower: 9.675, upper: 9.725 per side. Perimeter: 4 × lower = 38.70 cm, 4 × upper = 38.90 cm

SET 3 Answers

1. 0.00428

2. 78,000

3. 0.05

4. 597.88

5. 0.970

6. 3800

7. 310

8. 32,076

9. 0.078

10. 0.0098

11. 5438.28

12. 99

13. 303,000

14. 8.58

15. Lower: 18.035, Upper: 18.045

16. Lower: 4682, Upper: 4692

17. Lower: 8450, Upper: 8550

18. Lower: 62.5, Upper: 63.5

19. $0.06785 \leq x < 0.06795$

20. $19.475 \text{ cm} \leq \text{length} < 19.525 \text{ cm}$

21. $250 \div 8 = 31.25$

22. $5 \times 0.08 = 0.4$

23. $500 \times £0.30 = £150$

24. $\sqrt{169} = 13$; so estimate is 13

25. $\sqrt{324} = 18$, $\sqrt{361} = 19$; so estimate is about 18

26. $50 + 10 - 40 = 20$

27. $0.2 \times 4 = 0.8$

28. Max a: 10.65, Max b: 71.85; sum = 82.5

29. Min x: 4.25, Min y: 2.15; product = $4.25 \times 2.15 \approx 9.14$

30. $2.465 \leq \text{weight} < 2.475 \text{ kg}$

31. The result is not accurate beyond one significant figure, so 1.1342 should be rounded to 1.

32. $\sqrt{36} = 6$, actual $\sqrt{35} \approx 5.92$, so it's an overestimate.

33. $\sqrt{25} = 5$, actual $\sqrt{27} \approx 5.2$, so it's an underestimate.

34. $124.95 \leq \text{mass} < 125.05 \text{ g}$

35. $4.2325 \leq \text{length} < 4.2375 \text{ m}$

36. $60 \div 9 + 2 = 8.7$

37. $(10 - 3) \times 2 = 14$

38. $400 \times 0.1 = 40$

39. $1300 + 400 + 50 = 1{,}750$

40. $0.03 \times 400 = 12$

41. $4.565 \leq x < 4.575$

42. 17.25 ≤ time < 17.35 seconds

43. √49, because it's closer to 50 than √64

44. 600 × 60 ÷ 30 = 1,200

45. £8.50 ÷ £0.30 = 28 (using 30p per sweet, answer is about 28 sweets)

46. 350 ÷ 20 = 17.5

47. 0.02 × 0.004 = 0.00008

48. 2100 ÷ 60 = 35

49. 0.9835 ≤ weight < 0.9845 kg

50. Because it greatly simplifies calculations and provides a quick estimate appropriate for checking or initial planning

answers of SET 4

Here are the answers for SET 4

1. 0.007185

2. 535,000

3. 0.092

4. 8755.0

5. 1.398

6. 5000

7. 0.0395

8. 45,700

9. 0.83

10. 0.00487

11. 16284.24

12. 100

13. 500,000

14. 7.932

15. Lower: 0.3835, Upper: 0.3845

16. Lower: 6700, Upper: 6800

17. Lower: 565,000, Upper: 569,999.5

18. Lower: 88.25, Upper: 88.35

19. $0.004285 \leq x < 0.004295$

20. $24.945 \leq \text{length} < 24.955$ m

21. $320 \div 7 = 45.71$

22. $3 \times 0.09 = 0.27$

23. $400 \times £0.70 = £280$

24. Closest are $\sqrt{121} = 11$, so estimate 11

25. Closest are $\sqrt{400} = 20$, $\sqrt{441} = 21$, so estimate about 20

26. $100 + 20 - 70 = 50$

27. $0.6 \times 6 = 3.6$

28. Max u: 13.85, max v: 51.95; sum: 65.8

29. Min p: 5.35, min q: 1.85; product = 9.8975

30. $14.315 \leq \text{mass} < 14.325$ kg

31. Because you can't be more accurate than your least accurate input

32. Overestimate

33. Underestimate

34. $873.25 \leq \text{mass} < 873.75$ g

35. $2.3925 \leq \text{length} < 2.3975$ m

36. $60 \div 8 + 3 = 10.5$

37. $(9 - 2) \times 3 = 21$

38. $1300 \times 0.04 = 52$

39. $800 + 400 + 100 = 1,300$

40. $0.02 \times 300 = 6$

41. $6.9245 \leq x < 6.9335$

42. 2.45 ≤ time < 2.55 hours

43. √121 = 11 is closer to 115 than √100 = 10

44. 800 × 20 ÷ 90 = 177.8

45. £42 ÷ £7 = 6

46. 600 ÷ 10 = 60

47. 0.02 × 0.09 = 0.0018

48. 3700 ÷ 80 = 46.25

49. 1.8665 ≤ weight < 1.8675 kg

50. Because division by zero is undefined and produces incorrect results

answers of SET 5

1. 0.00259

2. 650,000

3. 0.079

4. 98,300

5. 4.3813

6. 5000

7. 0.0659

8. 73,000

9. 0.3

10. 0.0062

11. 16724.837

12. 390

13. 930,000

14. 6.285

15. 0.84

16. 16,700

17. 240,000

18. 108.5

19. $0.02505 \le x < 0.02515$

20. $7.8525 \le x < 7.8575$ m

21. $540 \div 8 = 67.5$

22. $7 \times 0.09 = 0.63$

23. $500 \times £20 = £10,000$

24. $\sqrt{121} = 11$, $\sqrt{144} = 12$ (so 11.4)

25. $\sqrt{784} = 28$, $\sqrt{841} = 29$ (so 28.3)

26. $90 + 20 - 60 = 50$

27. $1 \times 6 = 6$

28. $15.45 + 27.95 = 43.4$

29. $5.65 \times 2.45 = 13.8425$

30. $3.855 \le$ mass < 3.865 kg

31. The calculation is limited by the least accurate value.

32. Overestimate

33. Underestimate

34. $2.425 \le x < 2.475$ kg

35. $3.7625 \le x < 3.7675$ m

36. $80 \div 9 + 3 = 11.9$

37. $(5 \times 6) - 2 = 28$

38. $1700 \times 0.05 = 85$

39. $800 + 400 + 80 = 1,280$

40. $0.01 \times 300 = 3$

41. $3.8455 \le x < 3.8465$

42. $42.55 \le t < 42.65$ s

43. $\sqrt{196} = 14$ (closer to 195)

44. 1000 × 30 ÷ 100 = 300

45. £124 ÷ £20 = 6

46. 1000 ÷ 20 = 50

47. 0.02 × 0.09 = 0.0018

48. 4000 ÷ 80 = 50

49. 1.8455 ≤ x < 1.8465 kg

50. You may divide by zero, which is impossible/undefined.

51. 0.0096

52. 98,200

53. 0.118

54. 6790

55. 8.0218

56. 4,600

57. 0.065

58. 81,000

59. 0.2

60. 0.0029

61. 6924.833

62. 990

63. 670,000

64. 5.843

65. 0.64

66. 19,100

67. 490,000

68. 209.3

69. 0.01725 ≤ x < 0.01735

70. 11.4325 ≤ x < 11.4375 m

71. 440 ÷ 10 = 44

72. 8 × 0.09 = 0.72

73. 600 × £6 = £3,600

74. √289 = 17, √324 = 18 (so 17.3)

75. √121 = 11, √144 = 12 (so 11.0)

76. 80 + 20 − 60 = 40

77. 1 × 5 = 5

78. 9.85 + 51.45 = 61.3

79. 6.35 × 3.25 = 20.6375

80. 5.635 ≤ x < 5.645 kg

81. The least accurate input limits the final accuracy.

82. Underestimate

83. Overestimate

84. 8.125 ≤ x < 8.175 kg

85. 7.4525 ≤ x < 7.4575 m

86. 40 ÷ 7 + 4 = 9.7

87. (5 × 8) − 3 = 37

88. 1200 × 0.05 = 60

89. 1000 + 300 + 200 = 1,500

90. 0.03 × 200 = 6

91. 8.2755 ≤ x < 8.2765

92. 13.55 ≤ t < 13.65 s

93. √289 = 17 (closer to 305)

94. 1000 × 20 ÷ 100 = 200

95. £65 ÷ £8 = 8

96. 700 ÷ 10 = 70

97. 0.02 × 0.06 = 0.0012

98. 2500 ÷ 80 = 31.25

99. 2.8605 ≤ x < 2.8615 kg

100.   Compounds initial errors and can change the answer's reasonableness

now answers of SET 6

Here are the answers for SET 6

1. 0.00386
2. 850,000
3. 0.090
4. 42,700
5. 5.6183
6. 3000
7. 0.0578
8. 68,000
9. 0.5
10. 0.0052
11. 13724.283
12. 800
13. 640,000
14. 4.897
15. 0.42
16. 47,100
17. 330,000
18. 67.8
19. $0.03285 \leq x < 0.03295$
20. $8.4525 \leq x < 8.4575$ m
21. $700 \div 8 = 87.5$
22. $8 \times 0.1 = 0.8$

23. 800 × £0.10 = £80

24. √169 = 13, √196 = 14 (so 13.2)

25. √841 = 29, √900 = 30 (so 29.1)

26. 100 + 30 − 80 = 50

27. 1 × 5 = 5

28. 13.95 + 39.85 = 53.8

29. 7.55 × 3.65 = 27.5575

30. 6.465 ≤ mass < 6.475 kg

31. Accuracy is limited by the least accurate input.

32. Underestimate

33. Overestimate

34. 2.875 ≤ x < 2.925 kg

35. 5.897 ≤ x < 5.899 m

36. 70 ÷ 8 + 4 = 12.75

37. (6 × 10) − 3 = 57

38. 2000 × 0.06 = 120

39. 600 + 300 + 80 = 980

40. 0.03 × 200 = 6

41. 7.6235 ≤ x < 7.6245

42. 33.55 ≤ t < 33.65 s

43. √144 = 12 (closer to 148)

44. 800 × 30 ÷ 100 = 240

45. £80 ÷ £10 = 8

46. 800 ÷ 10 = 80

47. 0.02 × 0.1 = 0.002

48. 4600 ÷ 80 = 57.5

49. 2.3745 ≤ x < 2.3755 kg

50. Division by zero is undefined.

51. 0.0077

52. 78,200

53. 0.213

54. 4840

55. 4.9122

56. 2,200

57. 0.045

58. 73,000

59. 0.1

60. 0.0074

61. 6382.432

62. 991

63. 780,000

64. 3.486

65. 0.95

66. 21,100

67. 430,000

68. 106.8

69. $0.01885 \leq x < 0.01895$

70. $16.4325 \leq x < 16.4375$ m

71. $240 \div 6 = 40$

72. $7 \times 0.08 = 0.56$

73. $800 \times £8 = £6,400$

74. $\sqrt{324} = 18$, $\sqrt{361} = 19$ (so 18.7)

75. $\sqrt{256} = 16$, $\sqrt{289} = 17$ (so 16.2)

76. $90 + 40 - 80 = 50$

77. $1 \times 7 = 7$

78. $22.35 + 16.85 = 39.2$

79. 7.25 × 3.35 = 24.2875

80. 4.315 ≤ x < 4.325 kg

81. Because the output cannot be more accurate than the weakest input.

82. Underestimate

83. Overestimate

84. 7.025 ≤ x < 7.075 kg

85. 8.697 ≤ x < 8.699 m

86. 40 ÷ 7 + 3 = 8.7

87. (5 × 9) − 2 = 43

88. 2000 × 0.06 = 120

89. 1000 + 200 + 100 = 1,300

90. 0.03 × 300 = 9

91. 2.9855 ≤ x < 2.9865

92. 63.75 ≤ t < 63.85 s

93. √400 = 20 (closer to 420)

94. 1000 × 30 ÷ 100 = 300

95. £41 ÷ £6 = 6

96. 500 ÷ 10 = 50

97. 0.02 × 0.08 = 0.0016

98. 2600 ÷ 70 = 37.1

99. 3.6505 ≤ x < 3.6515 kg

100.   Each step compounds error, making the final result less accurate

answers of set 7

1.   0.00294

2.   730,000

3. 0.089

4. 31,900

5. 5.2976

6. 5000

7. 0.0532

8. 45,000

9. 0.3

10. 0.0077

11. 13241.108

12. 700

13. 590,000

14. 4.817

15. 0.57

16. 54,200

17. 330,000

18. 83.4

19. $0.04355 \leq x < 0.04365$

20. $7.4225 \leq x < 7.4275$ m

21. $500 \div 7 = 71.4$

22. $6 \times 0.2 = 1.2$

23. $500 \times £0.30 = £150$

24. $\sqrt{144} = 12$, $\sqrt{169} = 13$ (so 12.8)

25. $\sqrt{729} = 27$, $\sqrt{784} = 28$ (so 27.6)

26. $120 + 40 - 90 = 70$

27. $1 \times 4 = 4$

28. $14.85 + 28.55 = 43.4$

29. $9.75 \times 2.45 = 23.8875$

30. $5.725 \leq x < 5.735$ kg

31. Result is limited by the least accurate input.

32. Overestimate

33. Overestimate

34. 3.825 ≤ x < 3.875 kg

35. 4.646 ≤ x < 4.648 m

36. 60 ÷ 6 + 5 = 15

37. (5 × 6) − 2 = 28

38. 1200 × 0.07 = 84

39. 400 + 200 + 100 = 700

40. 0.02 × 100 = 2

41. 5.3935 ≤ x < 5.3945

42. 73.75 ≤ t < 73.85 s

43. √324 = 18 (closer to 340)

44. 500 × 30 ÷ 100 = 150

45. £135 ÷ £16 = 8

46. 300 ÷ 9 = 33.3

47. 0.02 × 0.08 = 0.0016

48. 3400 ÷ 70 = 48.6

49. 1.7835 ≤ x < 1.7845 kg

50. Division by zero gives no valid result.

51. 0.0087

52. 67,400

53. 0.198

54. 2750

55. 8.6132

56. 3,600

57. 0.045

58. 66,000

59. 0.1

60. 0.0043

61. 5197.983

62. 434

63. 580,000

64. 7.396

65. 0.98

66. 22,900

67. 490,000

68. 111.3

69. 0.01385 ≤ x < 0.01395

70. 13.4525 ≤ x < 13.4575 m

71. 500 ÷ 8 = 62.5

72. 6 × 0.07 = 0.42

73. 400 × £20 = £8,000

74. √900 = 30, √841 = 29 (so 29.7)

75. √676 = 26, √729 = 27 (so 26.6)

76. 100 + 30 − 90 = 40

77. 1 × 9 = 9

78. 21.75 + 13.45 = 35.2

79. 6.75 × 2.65 = 17.8875

80. 6.525 ≤ x < 6.535 kg

81. Output cannot improve the weakest input's accuracy.

82. Exact

83. Overestimate

84. 6.225 ≤ x < 6.275 kg

85. 7.988 ≤ x < 7.990 m

86. 20 ÷ 4 + 7 = 12

87. (4 × 9) − 1 = 35

88. 1500 × 0.05 = 75

89. 600 + 200 + 100 = 900

90. 0.02 × 300 = 6

91. 3.7405 ≤ x < 3.7415

92. 27.75 ≤ t < 27.85 s

93. √400 = 20 (closer to 390)

94. 1000 × 20 ÷ 100 = 200

95. £395 ÷ £26 = 15

96. 200 ÷ 7 = 28.6

97. 0.03 × 0.09 = 0.0027

98. 2300 ÷ 80 = 28.75

99. 4.2705 ≤ x < 4.2715 kg

100.   Rounding propagates and can magnify errors in results