

CHAPTER 17 Ratio and Proportion

The first part of this chapter is revision of the work in Book 2A, although problems with mixed units are dealt with more thoroughly here.

EXERCISE 17a (p. 288)

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|---------------|--------------|---------------|--------------|
| 1. 2 : 3 | 7. 4 : 9 | 13. 5 : 16 | 19. 2.63 : 1 |
| 2. 1 : 2 : 3 | 8. 3 : 5 : 4 | 14. 1.5 : 1 | 20. 1.33 : 1 |
| 3. 7 : 5 | 9. 2 : 3 : 1 | 15. 2.4 : 1 | 21. 0.75 : 1 |
| 4. 2 : 3 | 10. 6 : 11 | 16. 0.857 : 1 | 22. 1.43 : 1 |
| 5. 18 : 8 : 9 | 11. 15 : 4 | 17. 2.73 : 1 | |
| 6. 2 : 3 : 1 | 12. 31 : 4 | 18. 0.6 : 1 | |

EXERCISE 17b (p. 289)

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|--------------|------------|------------|-------------|
| 1. 9 : 2 | 4. 2 : 125 | 7. 20 : 19 | 10. 9 : 10 |
| 2. 2 : 5 | 5. 9 : 20 | 8. 36 : 35 | 11. 25 : 24 |
| 3. 17 : 60 | 6. 50 : 3 | 9. 27 : 25 | |
| 12. a) 3 : 2 | b) 2 : 3 | c) 3 : 5 | |
| 13. a) 2 : 3 | b) 9 : 5 | c) 21 : 23 | d) 6 : 5 |
| 14. 18 : 25 | | | |
| 15. a) 1 : 1 | b) 1 : 2 | c) 1 : 8 | d) 1 : 1 |
| 16. a) 1 : 9 | b) 1 : 4 | c) 4 : 9 | e) 1 : 3 |
| | | | f) 1 : 8 |

EXERCISE 17c (p. 291)

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|---------------------------|----------------------------|-------------------------|
| 1. $1\frac{1}{9}$ or 1.11 | 7. $9\frac{1}{3}$ or 9.33 | 13. 12 grandsons; 3 : 7 |
| 2. $\frac{3}{7}$ or 0.429 | 8. $2\frac{8}{11}$ or 2.73 | 14. 152 |
| 3. $7\frac{1}{2}$ or 7.5 | 9. $1\frac{1}{5}$ or 1.2 | 15. 10.1cm |
| 4. $1\frac{3}{7}$ or 1.43 | 10. $7\frac{1}{5}$ or 7.2 | 16. 264 |
| 5. 24 | 11. $3\frac{1}{3}$ or 3.33 | |
| 6. $22\frac{1}{2}$ | 12. $8\frac{4}{7}$ or 8.57 | |

EXERCISE 17d (p. 293)

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|--|-----------------------|
| 1. £20, £25 | 5. 18 boys, 14 girls |
| 2. 54m, 42m | 6. 60°, 50°, 70° |
| 3. 0.625 kg, 1.25 kg, 3.125 kg | 7. 9, 12, 9 |
| 4. $\frac{1}{2}$ hr, $2\frac{1}{2}$ hrs, 4 hrs | 8. 66 hits, 24 misses |

EXERCISE 17e (p. 294)

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|-------------|---------------------------|-----------|-------------|-------------------|
| 1. 9 : 7 | 3. $5\frac{1}{4}$ | 5. 27.5cm | 7. 500 : 53 | 9. 3 : 4 |
| 2. 30m, 42m | 4. $2\frac{2}{9}$ or 2.22 | 6. 5 : 3 | 8. 4 : 3 | 10. $\frac{2}{3}$ |

Proportion: There are many different methods for dealing with problems on proportion but some of them are seen as black magic by the children.

Whichever method is used it should be used exclusively to avoid confusion.

Science and other subjects make great demands on the children’s mathematical ability and particularly so in proportion to problems, so it is as well for them to be familiar with the type of problem liable to crop up. They should also be prepared to use decimals as well as whole numbers.

The unitary method is based on the simplest idea but is not always the easiest to carry out and some people find the ratio method requires less work.

The third method is what some people call the “common sense” method, that is, to use a multiplying factor as in the following example:

At a steady speed a car uses 4 litres of petrol to travel 75 km. How much is needed for 60 km?

Amount needed = $4 \times \frac{60}{75}$ (we multiply by $\frac{60}{75}$ because *less* petrol is required to travel 60 km than 75 km) .

However, deciding on the multiplying factor can cause worry, as “common sense” does not always come into play. (This method used to be called “the rule of three”.)

EXERCISE 17f (p. 295)

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|---------------|-----------------------|---------------|------------|
| 1. a) £2.70 | b) £10.80 | 4. a) 35 rows | b) 42 rows |
| 2. a) 6 units | b) $\frac{3}{4}$ unit | 5. a) £1.65 | b) £7.92 |
| 3. a) 72km | b) 118.8km | | |

EXERCISE 17g (p. 295)

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|-----------------------------|----------|-----------------------|
| 1. £1.20 | 5. £9.80 | 9. 1.5m |
| 2. 15.5km | 6. £4.20 | 10. 5.5m ² |
| 3. $4\frac{1}{3}$ or 4.33km | 7. £8.30 | |
| 4. £3.65 | 8. 1.5p | |

EXERCISE 17h (p. 297)

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|---------------------------|-------------|
| 1. 3.2 litres | 7. 700 |
| 2. 3 hours | 8. £3.96 |
| 3. $12\frac{1}{2}$ units | 9. 66 rows |
| 4. 3.6 hours | 10. 20.25cm |
| 5. a) £45 b) 350 miles | 11. £336 |
| 6. £144 | 12. 480 |

13. 65.6km

14. a) 2.25×10^7 b) 8.1×10^6 c) 1.35×10^5

15. 15 V

17. 82.6 p, 83 p

16. 24.7 joules

18. £14.05

Inverse proportion: If a multiplying factor is used for direct proportion then it can also be used for inverse proportion, using common sense to decide which way up the factor should be. This method can only be used for numerical problems.

The unitary method is simpler than the ratio method for inverse proportion.

EXERCISE 17i (p. 300)1. $5\frac{1}{2}$ hours

4. 8 days

7. 16cm

2. 12

5. 25cm

8. 44

3. 203

6. 20

9. 48

EXERCISE 17j (p. 302)

1. a) 10 350 b) 5.22

5. 4.46cm

9. 1.44m

2. £145.35

6. 49

10. 6 weeks

3. $3\frac{1}{2}$ hours

7. 24

11. No answer

4. No answer

8. 34

12. 1.5 amps

EXERCISE 17k (p. 303)

1. 3 : 1

4. 114km (3 s.f.)

7. 9

2. $3\frac{3}{5}$ or 3.6

5. 6 hours 40 mins

8. $\frac{6}{5} : 1$ or 1.2 : 1

3. 8m, 16m, 32m

6. 6 : 2 : 1

EXERCISE 17l (p. 303)

1. 4 : 3

3. $6\frac{3}{5}$ or 6.6

5. 0.6 : 1

7. 1 : 3

2. 12, 8, 20

4. 8 : 7

6. £7.50

8. £37.50