

## AP and GP Questions

### Working forwards

- The first 3 terms of an arithmetic sequence are 13, 16, 19. Find the  $n$ th term, the 48th term and the sum of the first 30 terms.
- The first 3 terms of a geometric sequence are 6, 18, 54. Find the  $n$ th term, the 9th term and the sum of the first 10 terms.
- The first 3 terms of a geometric sequence are 32, 24, 18. Find the  $n$ th term, the 12th term, the sum of the first 20 terms and the sum to infinity.
- A sequence is defined by  $t_1 = 12$ ,  $t_n = t_{n-1} - 2$ . Find the  $n$ th term, the 35th term and the sum of the first 22 terms.
- Jodrell walks 12 km on Day 1. For the next 20 days he walks 0.5 km further than he did the previous day. How far does he walk on Day 21? How far does he walk in total in the 21 days?
- Misha walks 10 km on 1 November. Then, each day for the rest of the month she walks 5% further than she did the previous day. How far does she walk on 30 November? How far does he walk in total in November? On what day will she first have walked more than 200 km in the month?
- Fat Harry goes on an exercise program, but gets lazy. He walks 10 km the first day. Each subsequent day he walks 10% less than the previous day.
  - How far will he walk on the 20th day?
  - How far will he walk in total in the first 20 days?
  - Assuming he keeps this up for ever, how far will he walk altogether?
- Zogg got a job selling rabbits to farmers. In his first year he was paid \$55 000. At the end of each year he got a 3% rise. How much did he earn in his 6th year? How much did he earn in total in his first 10 years.
- A swinging door is opened  $90^\circ$ . When let go, it swings back  $150^\circ$  (so it is  $60^\circ$  from the closed position), then it swings forward  $120^\circ$  (so it is  $60^\circ$  from the closed position), then back  $96^\circ$  (so it is  $36^\circ$  from the closed position) and so on, each swing being  $\frac{4}{5}$  of the previous swing. How far from the closed position does it stop?
- Mabel leaves the pub and walks 1 km east, then 500 m west, then 250 m east, then 125 m west and so on. How far from the pub does she end up? If she walks at 2 km/h, how long does it take her to stop moving? What assumptions do you make in reaching your answers?
- Bronson leaves the pub and walks 1 km east,  $\frac{1}{2}$  km south, 250 m west, 125 m north, 62.5 m east and so on in a spiral pattern. How far from the pub does he end up?

### Working backwards

- The 4th term of an arithmetic progression is 20 and the 11th term is 55. What is the first term?
- The 6th term of a geometric progression is 50 and the second term is 100. What is the 12th term? What is the sum of the first 10 terms? How many terms are required for their sum to exceed 700?
- The 10th term of an AP is 41 and the sum of the first 6 terms is 363. What is the 60th term?
- The sum of the first 12 terms of an AP is 264 and the sum of the first 20 terms is 600. What is the 40th term? How many terms will be required for their sum to exceed 2000?

**Answers:** 1:  $13 + 3(n - 1)$ , 154, 1695. 2:  $6 \times 3^{n-1}$ , 39 366, 177 144. 3:  $32 \times \frac{3}{4}^{n-1}$ , 1.35, 127.6. 4:  $12 - 2(n - 1)$ , -56, -198. 5: 22 km, 357 km. 6: 41.16 km, 664.4 km, 15th. 7: 1.35 km, 87.8 km, 100 km. 8: \$63 760, \$630 513. 9: 6.666°. 10: 667 m, 1 h, assume she doesn't take any time to turn round. 11: 894 m. 12: 5. 13: 17.68, 613.9, 16 14: -109. 15: 89, 41.