

1. For each sequence given below, tell what the 407th term will be and briefly explain your reasoning.

- (a) a, b, c, a, b, c, \dots
- (b) $\triangle, \spadesuit, \clubsuit, \heartsuit, \triangle, \spadesuit, \clubsuit, \heartsuit, \dots$
- (c) $10, 5, 10, 5, 10, \dots$
- (d) duck, duck, goose, duck, duck, goose, \dots
- (e) $z, y, x, w, v, u, z, y, x, w, v, u, \dots$
- (f) $3, 9, 7, 1, 3, 9, 7, 1, \dots$
- (g) $30, 60, 90, 120, 150, 30, 60, 90, 120, 150, \dots$
- (h) $a, b, c, \dots, z, a, b, c, \dots, z, \dots$

2. Now find the indicated term for each sequence.

- (a) The 808th term of a, b, c, a, b, c, \dots
- (b) The 555th term of $\triangle, \spadesuit, \clubsuit, \heartsuit, \triangle, \spadesuit, \clubsuit, \heartsuit, \dots$
- (c) The 497th term of $30, 60, 90, 120, 150, 30, 60, 90, 120, 150, \dots$
- (d) The 1,143rd term of duck, duck, goose, duck, duck, goose, \dots
- (e) The 12,008th term of $z, y, x, w, v, u, z, y, x, w, v, u, \dots$

3. Find the ones digit of...

- (a) 9^{5023}
- (b) 7^{605}
- (c) 7^{19201}
- (d) 3^{4789}
- (e) 13^{526}
- (f) 284^{1026}
- (g) 54^{891}
- (h) 2^{9243}

4. Find the tens digit of...

- (a) 101^{57}
- (b) 51^{784}
- (c) 24^{598}
- (d) 21^{3290}
- (e) 15^{347} (challenge)

1.
 - (a) b – There are 135 full sets of three symbols in the first 407 terms, and 2 extra terms left over.
 - (b) ♣ – There are 101 full sets of four symbols in the first 407 terms, and 3 extra terms left over.
 - (c) 10 – The odd terms are all 10s; the even ones are 5s. The number 407 is odd.
 - (d) duck – There are 135 full sets of three symbols in the first 407 terms, and 2 extra terms left over.
 - (e) v – There are 67 full sets of six symbols in the first 407 terms, and 5 extra terms left over.
 - (f) 7 – There are 101 full sets of four symbols in the first 407 terms, and 3 extra terms left over.
 - (g) 60 – There are 81 full sets of five symbols in the first 407 terms, and 2 extra terms left over.
 - (h) q – There are 15 full sets of 26 symbols in the first 407 terms, and 17 extra terms left over.

2.
 - (a) a
 - (b) ♣
 - (c) 60
 - (d) goose
 - (e) y

3.
 - (a) 9
 - (b) 7
 - (c) 7
 - (d) 3
 - (e) 9
 - (f) 6
 - (g) 4
 - (h) 8

4.
 - (a) 0
 - (b) 0
 - (c) 7
 - (d) 0
 - (e) 7