Unit 1 · Set

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 33

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Same set or not?

ANSWER U · 4

a. **The same.** The factors of 12 are 1, 2, 3, 4, 6 and 12.

b. **The same.** Both are {*l*, *i*, *s*, *t*, *e*, *n*}: the same six letters in another order, and order doesn't matter in a set.

c. **The same.** 2 is the only even prime number: every other even number has 2 as a factor too.

d. **Not the same.** The first is {4, 8, 12, 16} and the second {2, 4, 6, 8, 10, 12, 14, 16, 18}. 2, 6, 10, 14 and 18 are in the second set only.

MARKING SCHEME

✓ a. The same, with the factors of 12 listed.

✓ b. The same, {*l*, *i*, *s*, *t*, *e*, *n*}, order doesn't matter.

✓ c. The same: 2 is the only even prime.

✓ d. Not the same, with both sets listed.

2 Spot the errors

ANSWER U · 3

i. **{*p*, *e*, *r*}.** A member is written only once, however many times the letter comes in the word.

ii. **{1, 2, 5, 10}.** 1 and the number itself are always factors: he left out 1 and 10.

iii. **7 ∈ *O*.** The member comes first, then the set.

MARKING SCHEME

✓ i. {*p*, *e*, *r*}: each member once.

✓ ii. {1, 2, 5, 10}: 1 and 10 are factors too.

✓ iii. 7 ∈ *O*: member first.

3 From clues to a set

ANSWER A · 4

i. The odd multiples of 3 up to 30 are 3, 9, 15, 21 and 27. Their digit sums are 3, 9, 6, 3 and 9. So $C = \{9, 27\}$.

ii. **18** joins: it is a multiple of 3 and $1 + 8 = 9$, but it is even.

iii. **"The number is a multiple of 3".** The numbers from 1 to 30 whose digits add up to 9 are 9, 18 and 27, and all three are multiples of 3 already. So the other two clues alone give {9, 27}.

MARKING SCHEME

✓ The odd multiples of 3 up to 30 tested.

✓ $C = \{9, 27\}$.

✓ 18 joins.

✓ "A multiple of 3" can go: 9, 18 and 27 are all multiples of 3.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

4 A class timetable

ANSWER A · 4

i. S = **{Sunday, Tuesday, Wednesday}** and C = **{Tuesday, Friday}**.

ii. **Thursday** $\notin M$ (no Math on Thursday); **Friday** $\in C$; **Saturday** $\notin S$ (Saturday is not in the timetable at all).

iii. M = {Sunday, Monday, Wednesday, Friday}. The days in both: **Sunday and Wednesday**.

iv. **No.** "Difficult" has no exact meaning: one student finds Math difficult, another finds English difficult. It is not well defined.

MARKING SCHEME

✓ S and C listed.

✓ Thursday $\notin M$, Friday $\in C$, Saturday $\notin S$.

✓ Sunday and Wednesday.

✓ Not a set: "difficult" is not well defined.

5 How many members?

ANSWER A · 3

i. **{14, 23, 32, 41, 50}**: **5 members**. (05 is not a 2-digit number.)

ii. **{105, 110, 115, 120, 125, 130, 135, 140, 145, 150}**: **10 members**. 101 and 151 are not multiples of 5, and "between" leaves them out anyway.

iii. k, a, k, a, r, b, h, i, t, t, a: **{k, a, r, b, h, i, t}**, **7 members**, though the word has 11 letters.

MARKING SCHEME

✓ i. {14, 23, 32, 41, 50}, 5 members.

✓ ii. The ten multiples from 105 to 150, 10 members.

✓ iii. {k, a, r, b, h, i, t}, 7 members.

6 Make the rule exact

ANSWER A · 4

i. "Big" has no exact meaning. One person might say 7 is big, another that only 19 is.

ii. For example, B = **{prime numbers between 10 and 20}**. ("Two-digit prime numbers less than 20" is right too.)

iii. B = **{x : x is a prime number between 10 and 20}**

iv. **23** $\notin B$: 23 is prime, but it is more than 20.

MARKING SCHEME

✓ "Big" is not well defined.

✓ An exact describing method giving {11, 13, 17, 19}.

✓ The same rule in set-builder form.

✓ $23 \notin B$.

7 Two digits in order

ANSWER HA · 4

i. **31** $\in P$ $(3 > 1)$; **13** $\notin P$ $(1 < 3)$; **55** $\notin P$ (5 is not bigger than 5); **90** $\in P$ $(9 > 0)$.

ii. Tens digit 1: only 10. Tens digit 2: 20 and 21. Tens digit 3: 30, 31 and 32. So **10, 20, 21, 30, 31, 32**.

iii. The ones digit can be 0, 1, 2, …, 8, anything smaller than 9: **9 members** (90 to 98).

MARKING SCHEME

✓ $31 \in$, $13 \notin$, $55 \notin$, $90 \in$.

✓ 10, 20, 21, 30, 31, 32.

✓ The ones digit can be 0 to 8.

✓ 9 members.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

8 Make your own

ANSWER A · 3

i. *noon*: n, o, o, n gives {*n*, *o*}. *on* gives {*o*, *n*}. Both have the members n and o only, so they are the **same set**.

ii. For example, *banana*: **{***b*, *a*, *n***}**. Also *level* {*l*, *e*, *v*}, *papaya* {*p*, *a*, *y*}.

iii. For example, *loop* and *pool* ({*l*, *o*, *p*}), *team* and *meat*, *dear* and *read*.

MARKING SCHEME

- ✓ Both sets are {*n*, *o*}.
- ✓ A word of 5 or more letters with exactly 3 different letters, and its set.
- ✓ Two words with the same set of letters.

9 Think: every one is the odd one out

ANSWER HA · 4

For example:

- **3** is the only **prime** number. The others make the set of composite numbers {8, 9, 21}.
- **8** is the only **even** number. The others make the set of odd numbers {3, 9, 21}.
- **9** is the only **square number** (3 × 3). The others are {3, 8, 21}, numbers that are not squares.
- **21** is the only **2-digit** number. The others make the set of 1-digit numbers {3, 8, 9}.

Other good reasons are right too, such as 8 being the only number that is not a multiple of 3.

MARKING SCHEME

- ✓ 3, with a reason (the only prime).
- ✓ 8, with a reason (the only even number).
- ✓ 9, with a reason (the only square number).
- ✓ 21, with a reason (the only 2-digit number).

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	7	18	8	**33**

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking