

**Key words:**

- ↗ **rational/irrational number:**  $\rightarrow$  fraction/ $\leftrightarrow$  fraction
- ↗ **arithmetic/geometric sequence:**  $a_{n+1} = a_n + d$  /  $a_{n+1} = a_n \times r$
- ↗ **sets:** element, (proper)subset, empty set, universal set, complement set, union/intersection set, Venn diagram
- ↗ **accuracy:** decimal places, significant figures
- ↗ **ratio:** (inverse)proportional to,  $\propto$ ,
- ↗ **percentage:** compound interest

1. For each of the following, tell whether it is rational or irrational. If it is rational, give its fraction form.

$$1.2, \frac{\pi}{3}, \frac{3}{5} - e, 1.\dot{7}, \sqrt{36}$$

2. In an arithmetic sequence  $\{a_n\}_{n>0}$ , if  $a_9 = 51, a_{15} = 27$

- (1) calculate  $a_1$  and the common difference  $d$ , give the expression for  $a_n$  in terms of  $n$
- (2) which term is the first term less than 10
- (3) how many terms do we need to add to make the summation to be zero.

3. In an geometric sequence  $\{a_n\}_{n>0}$ , if  $a_9 = 81, a_{12} = 3$

- (1) calculate  $a_1$  and the common ratio  $r$ , give the expression for  $a_n$  in terms of  $n$
- (2) which term is the first term less than 10

4. If  $U = \{x \in \mathbb{Z} | 0 < x \leq \sqrt{85}\}$ ,  $A = \{x \in U | x \text{ is prime}\}$ ,  $B = \{x \in U | x \text{ is odd}\}$

- (1) write set  $U, A, B$  explicitly
- (2) calculate  $A', A \cap B, A \cup B, A' \cup B$
- (3) list all the proper subsets of  $A$

5. A survey about the Countries they like. 37 students choose Japan, 48 students choose China, 45 students choose Korea. 15 students choose China and Korea, 13 students choose both Japan and Korea, 7 students choose both China and Japan. 5 Choose all of them.

- (1) draw a Venn diagram to represent the information
- (2) calculate the number of students who attend the survey

6. Round the number 0.0625 to i) 1 d.p. ii) 2 d.p. iii) 2 s.f. iv) 4 s.f.

7. Find the range of  $a$  if round  $a$

- (1) to 1 d.p. equals to 1.3
- (2) to 2 s.f. equals to 1.30

8. Sand and gravel are mixed in the ratio 5:3 to form ballast

- (1) how much gravel is mixed with 720 kg of sand?
- (2) how much sand is mixed with 720 kg of gravel?
- (3) how much gravel and sand are needed if 720 kg ballast are made?

9. A school can buy 150 books costing \$12 each. If the price is reduced by 20%, how many more books could be bought?

10. Find the expression for  $y$  in terms of  $x$

- (1)  $y - x \propto \frac{1}{x}$ ,  $y|_{x=1} = 3$
- (2)  $\frac{1}{y} \propto x^2 - 2$ ,  $y|_{x=2} = 1$
- (3)  $y - x \propto x^2 - y$ ,  $y|_{x=1} = 2$

11. How many years will it take for a debt to double at 15% compound interest?

12. A farmer takes 250 chickens to be sold at a market. In the first hour he sells 8% of his chickens. In the second hour he sells 10% of those that were left.

- (a) how many chickens has he sold in total?
- (b) what percentage of the original number did he manage to sell in the two hours?