MEMO 2026-11$\mathcal{E}$A-00002(1) Non-Real numbers

(1) Determine whether the following numbers are real or non-real. If real, indicate whether the number is rational or irrational:

(a) 7: **Real → Rational**

(b) $-\sqrt{3}$: **Real → Irrational**

(c) π: **Real → Irrational**

(d) $\sqrt{-16}$: **Non-Real**

(e) $0,\dot{3}$: **Real → Rational**

(f) $\frac{12}{36}$: **Real → Rational**

(g) $\sqrt[3]{-125} = -5$: **Real → Rational**

(h) $1 + \sqrt{9} = 1 + 3 = 4$: **Real → Rational**

(i) $\sqrt{(-2)^3} = \sqrt{-8}$: **Non-Real**

(j) 0: **Real → Rational**

(2) State whether the following statements are true or false:

(a) The product of two integers is always an integer again. **True**

(b) The product of two irrational numbers is always an irrational number. **False**

(c) If m is a natural number, then $\sqrt{4m}$ will also be a natural number. **True**

(d) The difference between two rational numbers is always a rational number. **True**

(e) The quotient of a rational number and an irrational number will always be rational. **False**

(3) For which values of x will the following statements be:
(i) undefined (ii) non-real

(a) $\dfrac{x+3}{x}$: **(i) $x = 0$** **(ii) None**

(b) $\sqrt{x-1}$: **(i) None** **(ii) $x - 1 < 0 \rightarrow x < 1$**

(c) $\dfrac{\sqrt{x}}{x+2}$: **(i) $x = -2$** **(ii) $x < 0$**

(4) Given: $\mathrm{P} = \sqrt[4]{3y} - 1$. To which of the following number system(s) would P belong if:
[Number systems: $\mathbb{N}$; $\mathbb{N}_0$; $\mathbb{Z}$; $\mathbb{Q}$; $\mathbb{Q}'$; $\mathbb{R}$ or $\mathbb{R}'$]

(a) $y = \frac{1}{3}$

$\mathbf{P} = \sqrt[4]{3 \times \frac{1}{3}} - 1$

$\mathbf{P} = \sqrt[4]{1} - 1$

$\mathbf{P} = 1 - 1 = 0$

$\mathbb{N}_0$; $\mathbb{Z}$; $\mathbb{Q}$; $\mathbb{R}$

(b) $y = -1$

$\mathbf{P} = \sqrt[4]{3 \times -1} - 1$

$\mathbf{P} = \sqrt[4]{-3} - 1$

$\mathbb{R}'$

(c) $y = 5$

$\mathbf{P} = \sqrt[4]{3 \times 5} - 1$

$\mathbf{P} = \sqrt[4]{15} - 1$

$\mathbb{Q}'$; $\mathbb{R}$