Exercise 7A

1. **(a)** Yes

(b) No, because the element 2 has two images.

(c) Yes

(d) Yes

(e) No, because the element 4 has no image.

(f) Yes

2. $f(x) = 6x - 4$

$f(2) = 6(2) - 4$

$= 8$

$f(-4) = 6(-4) - 4$

$= -28$

$f\left(\frac{1}{3}\right) = 6\left(\frac{1}{3}\right) - 4$

$= -2$

$f\left(-\frac{1}{2}\right) = 6\left(-\frac{1}{2}\right) - 4$

$= -7$

3. **(i)** $f(1) = 5 - 2(1)$

$= 3$

(ii) $f(-2) = 5 - 2(-2)$

$= 5 + 4$

$= 9$

(iii) $f(0) = 5 - 2(0)$

$= 5$

(iv) $f(3) = 5 - 2(3)$

$= 5 - 6$

$= -1$

$f(-3) = 5 - 2(-3)$

$= 5 + 6$

$= 11$

$f(3) + f(-3) = -1 + 11$

$= 10$

4. **(i)** $g(2) = 7(2) + 4$

$= 18$

(ii) $g(-3) = 7(-3) + 4$

$= -17$

(iii) $g\left(\frac{4}{7}\right) = 7\left(\frac{4}{7}\right) + 4$

$= 8$

(iv) $g(0) = 7(0) + 4$

$= 4$

$g(-1) = 7(-1) + 4$

$= -3$

$g(0) + g(-1) = 4 + (-3)$

$= 4 - 3$

$= 1$

(v) $g\left(\frac{1}{7}\right) = 7\left(\frac{1}{7}\right) + 4$

$= 5$

$g\left(-\frac{1}{7}\right) = 7\left(-\frac{1}{7}\right) + 4$

$= 3$

$g\left(\frac{1}{7}\right) - g\left(-\frac{1}{7}\right) = 5 - 3$

$= 2$

5. $f(x) = \frac{x}{2} + 3$

$g(x) = \frac{3}{4}x - 2$

(a) **(i)** $f(2) = \frac{2}{2} + 3$

$= 4$

$g(2) = \frac{3}{4}(2) - 2$

$= \frac{3}{2} - 2$

$= -\frac{1}{2}$

$f(2) + g(2) = 4 - \frac{1}{2}$

$= 3\frac{1}{2}$

(ii) $f(-1) = \frac{-1}{2} + 3$

$= 2\frac{1}{2}$

$g(-1) = \frac{3}{4}(-1) - 2$

$= -2\frac{3}{4}$

$f(-1) - g(-1) = 2\frac{1}{2} - \left(-2\frac{3}{4}\right)$

$= 5\frac{1}{4}$

Ex#7

Q#6

(v) $f(x) = g(x)$

$5x - 9 = 2 - 6x$

$11x = 11$

$x = 1$

(vi) $2f(x) = 3g(x)$

$2(5x - 9) = 3(2 - 6x)$

$10x - 18 = 6 - 18x$

$28x = 24$

$x = \frac{6}{7}$

7. $f(x) = 4x + 9$

$f(1) = 4(1) + 9$

$= 13$

$f(2) = 4(2) + 9$

$= 17$

$f(3) = 4(3) + 9$

$= 21$

(i) $f(1) + f(2) = 13 + 17$

$= 30$

$f(1 + 2) = f(3) = 21$

$\therefore f(1) + f(2) \neq f(1 + 2)$

(ii) $f(3) - f(2) = 21 - 17$

$= 4$

$f(3 - 2) = f(1) = 13$

$\therefore f(3) - f(2) \neq f(3 - 2)$

(iii) $f(1) \times f(2) = 13 \times 17$

$= 221$

$f(1 \times 2) = f(2) = 17$

$\therefore f(1) \times f(2) \neq f(1 \times 2)$

(iv) $f(2) \div f(1) = 17 \div 13$

$= 1\frac{4}{13}$

$f(2 \quad 1) = f(2) = 17$

$\therefore f(2) \div f(1) \neq f(2 \div 1)$

8. $f(x) = \frac{3}{4}x + \frac{1}{2}$

$f(2) = \frac{3}{4}(2) + \frac{1}{2}$

$= 2$

$f\left(-\frac{1}{2}\right) = \frac{3}{4}\left(-\frac{1}{2}\right) + \frac{1}{2}$

$= \frac{1}{8}$

$g(x) = 1\frac{1}{4} - \frac{2}{3}x$

$g(3) = 1\frac{1}{4} - \frac{2}{3}(3)$

$= -\frac{3}{4}$

$g(-6) = 1\frac{1}{4} - \frac{2}{3}(-6)$

$= 5\frac{1}{4}$

Q#8

(i) $f(3) = \frac{3}{4}(3) + \frac{1}{2}$

$= 2\frac{3}{4}$

$f(2) + f(3) = 2 + 2\frac{3}{4}$

$= 4\frac{3}{4}$

$f(2 + 3) = f(5)$

$= \frac{3}{4}(5) + \frac{1}{2}$

$= 4\frac{1}{4}$

$\therefore f(2) + f(3) \neq f(2 + 3)$

(ii) $g(4) = 1\frac{1}{4} - \frac{2}{3}(4)$

$= -1\frac{5}{12}$

$g(2) = 1\frac{1}{4} - \frac{2}{3}(2)$

$= -\frac{1}{12}$

$g(4) - g(2) = -1\frac{5}{12} - \left(-\frac{1}{12}\right)$

$= -1\frac{5}{12} + \frac{1}{12}$

$= -1\frac{1}{3}$

$g(4 - 2) = g(2) = -\frac{1}{12}$

$\therefore g(4) - g(2) \neq g(4 - 2)$

(iii) $f(x) = g(x)$

$\frac{3}{4}x + \frac{1}{2} = 1\frac{1}{4} - \frac{2}{3}x$

$\frac{3}{4}x + \frac{2}{3}x = 1\frac{1}{4} - \frac{1}{2}$

$\frac{17}{12}x = \frac{3}{4}$

$x = \frac{9}{17}$

(iv) $f(a) = \frac{3}{4}a + \frac{1}{2}$

$f(2a) = \frac{3}{4}(2a) + \frac{1}{2}$

$= 1\frac{1}{2}a + \frac{1}{2}$

$g(3a) = 1\frac{1}{4} - \frac{2}{3}(3a)$

$= 1\frac{1}{4} - 2a$

Q#8

(v) $f(a+1) = \frac{3}{4}(a+1) + \frac{1}{2}$

$= \frac{3}{4}a + \frac{3}{4} + \frac{1}{2}$

$= \frac{3}{4}a + 1\frac{1}{4}$

$g(a) = 1\frac{1}{4} - \frac{2}{3}a$

$f(a+1) + g(a) = \frac{3}{4}a + 1\frac{1}{4} + 1\frac{1}{4} - \frac{2}{3}a$

$= \frac{1}{12}a + 2\frac{1}{2}$

For $f(a+1) + g(a) = 5$,

$\frac{1}{12}a + 2\frac{1}{2} = 5$

$\frac{1}{12}a = 5 - 2\frac{1}{2}$

$= 2\frac{1}{2}$

$\therefore a = 30$

(vi) $f(2a) = \frac{3}{4}(2a) + \frac{1}{2}$

$= \frac{3}{2}a + \frac{1}{2}$

$g(6a) = 1\frac{1}{4} - \frac{2}{3}(6a)$

$= 1\frac{1}{4} - 4a$

For $f(2a) = g(6a)$,

$\frac{3}{2}a + \frac{1}{2} = 1\frac{1}{4} - 4a$

$\frac{11}{2}a = \frac{3}{4}$

$\therefore a = \frac{3}{22}$