

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

$$\begin{aligned}f(2) &= 6(2) - 4 \\ &= 8\end{aligned}$$

$$\begin{aligned}f(-4) &= 6(-4) - 4 \\ &= -28\end{aligned}$$

$$\begin{aligned}f\left(\frac{1}{3}\right) &= 6\left(\frac{1}{3}\right) - 4 \\ &= -2\end{aligned}$$

$$\begin{aligned}f\left(-\frac{1}{2}\right) &= 6\left(-\frac{1}{2}\right) - 4 \\ &= -7\end{aligned}$$

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) $f(3) = 5 - 2(3)$
 $= 5 - 6$
 $= -1$

$$\begin{aligned}f(-3) &= 5 - 2(-3) \\ &= 5 + 6 \\ &= 11\end{aligned}$$

$$\begin{aligned}f(3) + f(-3) &= -1 + 11 \\ &= 10\end{aligned}$$

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

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

$$5x - 9 = 2 - 6x$$

$$11x = 11$$

$$x = 1$$

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

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

$$10x - 18 = 6 - 18x$$

$$28x = 24$$

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

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

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

$$= 13$$

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

$$= 17$$

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

$$= 21$$

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

$$= 30$$

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

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

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

$$= 4$$

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

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

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

$$= 221$$

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

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

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

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

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

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

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

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

$$= 2$$

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

$$= \frac{1}{8}$$

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

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

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

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

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

Q#8

$$\begin{aligned} \text{(i)} \quad f(3) &= \frac{3}{4}(3) + \frac{1}{2} \\ &= 2\frac{3}{4} \end{aligned}$$

$$\begin{aligned} f(2) + f(3) &= 2 + 2\frac{3}{4} \\ &= 4\frac{3}{4} \end{aligned}$$

$$\begin{aligned} f(2+3) &= f(5) \\ &= \frac{3}{4}(5) + \frac{1}{2} \\ &= 4\frac{1}{4} \end{aligned}$$

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

$$\begin{aligned} \text{(ii)} \quad g(4) &= 1\frac{1}{4} - \frac{2}{3}(4) \\ &= -1\frac{5}{12} \end{aligned}$$

$$\begin{aligned} g(2) &= 1\frac{1}{4} - \frac{2}{3}(2) \\ &= -\frac{1}{12} \end{aligned}$$

$$\begin{aligned} g(4) - g(2) &= -1\frac{5}{12} - \left(-\frac{1}{12}\right) \\ &= -1\frac{5}{12} + \frac{1}{12} \\ &= -1\frac{1}{3} \end{aligned}$$

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

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

$$\begin{aligned} \text{(iii)} \quad f(x) &= g(x) \\ \frac{3}{4}x + \frac{1}{2} &= 1\frac{1}{4} - \frac{2}{3}x \\ \frac{3}{4}x + \frac{2}{3}x &= 1\frac{1}{4} - \frac{1}{2} \\ \frac{17}{12}x &= \frac{3}{4} \\ x &= \frac{9}{17} \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad f(a) &= \frac{3}{4}a + \frac{1}{2} \\ f(2a) &= \frac{3}{4}(2a) + \frac{1}{2} \\ &= 1\frac{1}{2}a + \frac{1}{2} \\ g(3a) &= 1\frac{1}{4} - \frac{2}{3}(3a) \\ &= 1\frac{1}{4} - 2a \end{aligned}$$

$$\begin{aligned}
 \text{(v)} \quad f(a+1) &= \frac{3}{4}(a+1) + \frac{1}{2} \\
 &= \frac{3}{4}a + \frac{3}{4} + \frac{1}{2} \\
 &= \frac{3}{4}a + 1\frac{1}{4}
 \end{aligned}$$

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

$$\begin{aligned}
 f(a+1) + g(a) &= \frac{3}{4}a + 1\frac{1}{4} + 1\frac{1}{4} - \frac{2}{3}a \\
 &= \frac{1}{12}a + 2\frac{1}{2}
 \end{aligned}$$

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

$$\begin{aligned}
 \frac{1}{12}a + 2\frac{1}{2} &= 5 \\
 \frac{1}{12}a &= 5 - 2\frac{1}{2} \\
 &= 2\frac{1}{2} \\
 \therefore a &= 30
 \end{aligned}$$

$$\begin{aligned}
 \text{(vi)} \quad f(2a) &= \frac{3}{4}(2a) + \frac{1}{2} \\
 &= \frac{3}{2}a + \frac{1}{2}
 \end{aligned}$$

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

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

$$\begin{aligned}
 \frac{3}{2}a + \frac{1}{2} &= 1\frac{1}{4} - 4a \\
 \frac{11}{2}a &= \frac{3}{4} \\
 \therefore a &= \frac{3}{22}
 \end{aligned}$$

Q#8