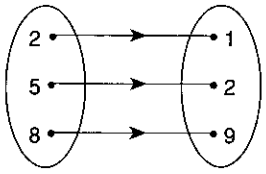
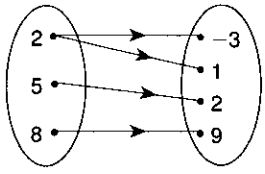
1. Which of the following relations is not a function? State your reason. **[07-10-02-NAM11]**

(a)



(b)

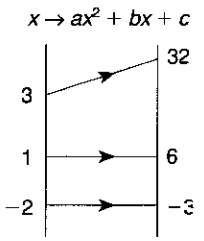


2. A function f is defined by $f: x \mapsto 4x + 2$. Find the images of -1, 3 and 5.

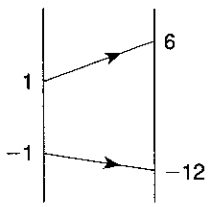
3. A function g is defined by $g: x \mapsto 3 + \frac{4}{x-1}$, $x \neq 1$. Find the images of -2, $\frac{1}{2}$ and $\frac{5}{4}$.

4. A function f is defined by $f: x \mapsto ax + b$. The images of 1 and 5 are -2 and 10 respectively. Calculate the value of a and of b.

5. The arrow diagram shows part of the function $f: x \mapsto ax^2 + bx + c$.
Find
(a) the values of a, b and c,
(b) the positive number x whose image is 2.

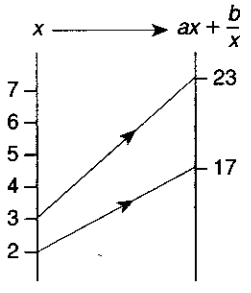


6. The arrow diagram shows part of the mapping $f: x \mapsto \frac{24}{ax+b}$, $x \neq -\frac{b}{a}$, $a \neq 0$.
(a) Find the value of a and of b.
(b) Find the element that has an image of 8 under this mapping.
(c) Find the two values of x for which $f(x) = x$.



7. Given the function $f: x \mapsto \frac{2}{ax+b}$, $x \neq \frac{-b}{a}$ such that $f(0) = -2$ and $f(2) = 2$, find
(a) the value of a and of b,
(b) the values of x for which $f(x) = x$.
Show that $f(p) + f(-p) = 2f(p^2)$.

8. The arrow diagram represents part of the mapping $x \mapsto ax + \frac{b}{x}$, $x \neq 0$. Find
(a) the value of a and of b,
(b) the image of 1 under this mapping.



9. The functions f are defined as follows:

(a) $f: x \mapsto 5x - 1$, **(b)** $f: x \mapsto 2x + 1$,

(c) $f: x \mapsto 5 - x$, **(d)** $f: x \mapsto 7 - 2x$.

For each of the functions, find

(i) the range corresponding to a domain of $1 \leqslant x \leqslant 3$,

(ii) the domain corresponding to a range of $-1 \leqslant f(x) \leqslant 5$.

10. The function f is defined for real values of x by $f: x \mapsto x^2 - 2x$.

(a) Find the range of f corresponding to the domain $-2 \leqslant x \leqslant 0$.

(b) State another domain for which f has the same range.

11. **(a)** Given that $f: x \mapsto 4x^2 - 3$, find a domain of x corresponding to the range $1 < f(x) < 13$.

(b) Given that $g: x \mapsto (x + 1)^2$, find the range of g corresponding to the domain

(i) $0 \leqslant x \leqslant 2$, **(ii)** $-2 \leqslant x \leqslant 2$.

12. A function f is defined by $f: x \mapsto 2(x - 1)^2 + 1$.

(a) Find the range corresponding to the domain $0 \leqslant x \leqslant 3$.

(b) Find a domain of x corresponding to the range $3 \leqslant f(x) \leqslant 5$.

13. Two functions f and g are defined by $f: x \mapsto \frac{1}{x+1}$, $x \neq -1$, and $g: x \mapsto \frac{x}{x-2}$, $x \neq 2$. Find the values of x for which $f(x) = 10g(x)$.

14. Two functions f and g are defined by $f: x \mapsto \frac{3}{ax - b}$, $x \neq \frac{b}{a}$, and $g: x \mapsto bx + a$, where a and b are positive constants. Given that $f(1) = g(1)$ and $f(2)g(2) = 4$, find the value of a and of b.

15. Two functions are defined by $f: x \mapsto ax + 1$ and $g: x \mapsto \frac{4b}{x-1}$, $x \neq 1$, where a and b are constants. Given that $f(a) = g(b)$ and $f\left(\frac{1}{a}\right) = g\left(\frac{1}{b}\right)$, find the possible values of a and b.

Exercise 8.1 *(p. 128)*

1. The relation in (b) is not a function as $2 \mapsto -3$ and $2 \mapsto 1$.

2. -2, 14, 22 **3.** $\frac{5}{3}$, -5, 19 **4.** $a = 3$, $b = -5$

5. **(a)** $a = 2$, $b = 5$, $c = -1$ **(b)** $\frac{1}{2}$

6. **(a)** $a = 3$, $b = 1$ **(b)** $\frac{2}{3}$ **(c)** $2\frac{2}{3}$, -3

7. **(a)** $a = 1$, $b = -1$ **(b)** -1, 2 **8.** **(a)** $a = 7$, $b = 6$ **(b)** 13

9. **(a)** **(i)** $4 \leqslant f(x) \leqslant 14$ **(ii)** $0 \leqslant x \leqslant \frac{6}{5}$ **(b)** **(i)** $3 \leqslant f(x) \leqslant 7$ **(ii)** $-1 \leqslant x \leqslant 2$

(c) **(i)** $2 \leqslant f(x) \leqslant 4$ **(ii)** $0 \leqslant x \leqslant 6$ **(d)** **(i)** $1 \leqslant f(x) \leqslant 5$ **(ii)** $1 \leqslant x \leqslant 4$

10. **(a)** $0 \leqslant f(x) \leqslant 8$ **(b)** $2 \leqslant x \leqslant 4$

11. **(a)** $1 < x < 2$ **(b)** **(i)** $1 \leqslant g(x) \leqslant 9$ **(ii)** $0 \leqslant g(x) \leqslant 9$

12. **(a)** $1 \leqslant f(x) \leqslant 9$ **(b)** $2 \leqslant x \leqslant \sqrt{2} + 1$ or $1 - \sqrt{2} \leqslant x \leqslant 0$

13. $-\frac{1}{2}$, $-\frac{2}{5}$ **14.** $a = 2$, $b = 1$ **15.** $a = 1$, $b = -1$; $a = -1$, $b = -1$.