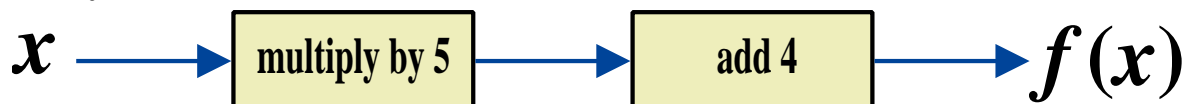**Lesson 6**

6.1 Inverse Functions from Flow Diagrams

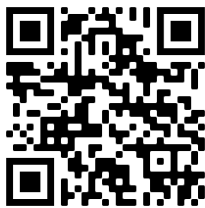Study the flow diagram below.

We're going to write down two algebraic expressions suggested by this flow diagram.

Firstly, what function does the flow diagram represent ?

Secondly, if you were to go backwards through the flow diagram, what *inverse function* would be obtained ?

x → | multiply by 5 | → | add 4 | → $f(x)$

Teaching Video : http://www.NumberWonder.co.uk/Video/v9002(6).mp4

☞

$f(x)\ =$

[1 mark]

☞

$f^{-1}(x)\ =$

[1 mark]

Having extracted the algebra we need from the flow diagram we can now answer some easy questions. Determine the value of,

(i) $f(8)$ **(ii)** $f^{-1}(29)$

☞   ☞

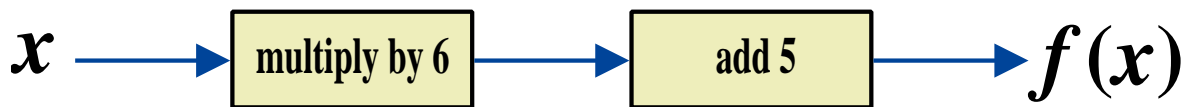**(iii)** $f(11)$ **(iv)** $f^{-1}(44)$

☞   ☞

Explain the connection between (i) and (iv)

☞

[5 marks]

6.2 Exercise

Marks Available: 54

Question 1

$$x \longrightarrow \boxed{\text{multiply by 6}} \longrightarrow \boxed{\text{add 5}} \longrightarrow f(x)$$

(**a**)   Write down   (**i**) $f(x)$

(**ii**) $f^{-1}(x)$

[**2 marks**]

(**b**)   Determine the value of,

(**i**) $f(4)$ (**ii**) $f^{-1}(41)$

(**iii**) $f(9)$ (**iv**) $f^{-1}(71)$

[**4 marks**]

Question 2

$$x \longrightarrow \boxed{\text{add 5}} \longrightarrow \boxed{\text{multiply by 6}} \longrightarrow g(x)$$
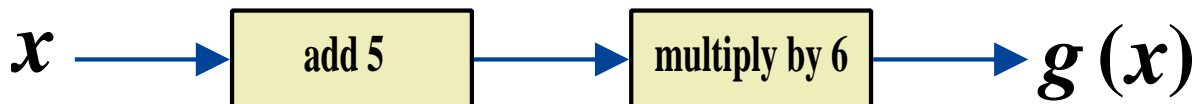
(**a**)   Write down   (**i**) $g(x)$

(**ii**) $g^{-1}(x)$

[**2 marks**]

(**b**)   Determine the value of,

(**i**) $g(4)$ (**ii**) $g^{-1}(48)$

(**iii**) $g(15)$ (**iv**) $g^{-1}(72)$

[**4 marks**]

Question 3

$$x \longrightarrow \boxed{\text{subtract 8}} \longrightarrow \boxed{\text{multiply by 7}} \longrightarrow h\,(x)$$
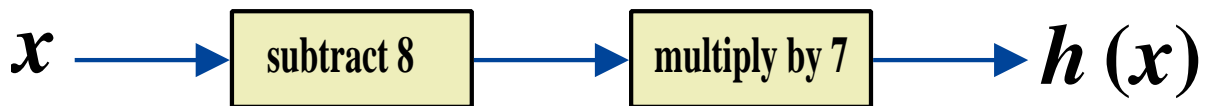
(**a**)   Write down   (**i**) $h\,(x)$

　　　　　　　　　　 (**ii**) $h^{-1}\,(x)$

[2 marks]

(**b**)   Determine the value of,

　　(**i**) $h\,(13)$ 　　　　　　　　　(**ii**) $h^{-1}\,(77)$

　　(**iii**) $h\,(28)$ 　　　　　　　　 (**iv**) $h^{-1}\,(490)$

[4 marks]

Question 4

$$x \longrightarrow \boxed{\text{multiply by 8}} \longrightarrow \boxed{\text{subtract 5}} \longrightarrow f\,(x)$$
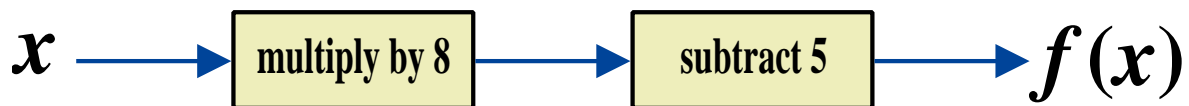
(**a**)   Write down   (**i**) $f\,(x)$

　　　　　　　　　　 (**ii**) $f^{-1}\,(x)$

[2 marks]

(**b**)   Determine the value of,

　　(**i**) $f\,(6)$ 　　　　　　　　　(**ii**) $f^{-1}\,(19)$

　　(**iii**) $f\,(1.5)$ 　　　　　　　　 (**iv**) $f^{-1}\,(83)$

[4 marks]

Question 5

x ⟶ | divide by 3 | ⟶ | add 11 | ⟶ $k\,(x)$
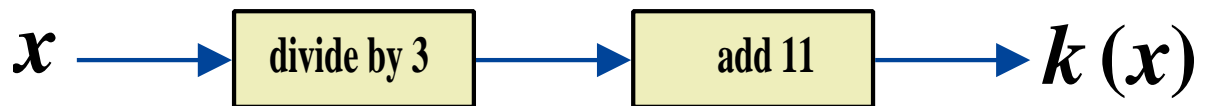
(**a**)   Write down   (**i**) $k\,(x)$

(**ii**) $k^{-1}(x)$

[2 marks]

(**b**)   Determine the value of,

(**i**) $k\,(66)$ 　　　　　　(**ii**) $k^{-1}(15)$

(**iii**) $k\,(21)$ 　　　　　(**iv**) $k^{-1}(19)$

[4 marks]

Question 6

x ⟶ | subtract 7 | ⟶ | divide by 5 | ⟶ $m\,(x)$
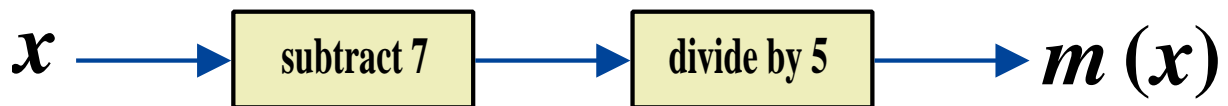
(**a**)   Write down   (**i**) $m\,(x)$

(**ii**) $m^{-1}(x)$

[2 marks]

(**b**)   Determine the value of,

(**i**) $m\,(22)$ 　　　　　(**ii**) $m^{-1}(1)$

(**iii**) $m\,(37)$ 　　　　　(**iv**) $m^{-1}(8)$

[4 marks]

Question 7

(a)   Fill in the flow diagram for the function

$$f(x) = 6x - 7$$

x → [ ] → [ ] → $f(x)$
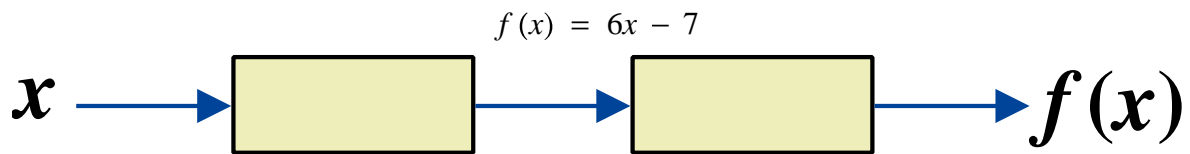
[1 mark]

(b)   Write down $f^{-1}(x)$

[1 mark]

(c)   Determine the value of,

(i) $f(10)$ (ii) $f^{-1}(11)$

(iii) $f(9)$ (iv) $f^{-1}(29)$

[4 marks]

Question 8

(a)   Fill in the flow diagram for the function

$$g(x) = \frac{x - 5}{4}$$

x → [ ] → [ ] → $g(x)$
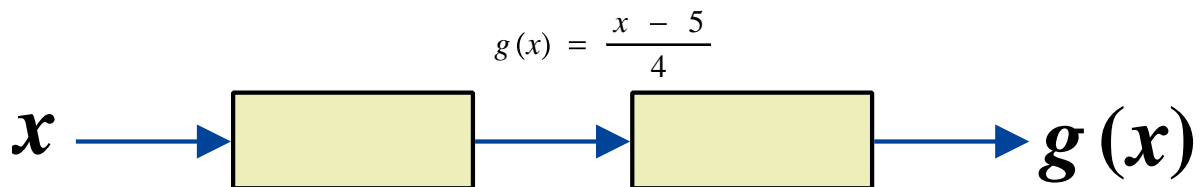
[1 mark]

(b)   Write down $g^{-1}(x)$

[1 mark]

(c)   Determine the value of,

(i) $g(13)$ (ii) $g^{-1}(11)$

(iii) $g(37)$ (iv) $g^{-1}(7)$

[4 marks]

Question 9

Consider the function, $f(x) = 8x + 3$

Find an expression for the inverse function $f^{-1}(x)$
HINT : Draw a flow diagram.

[3 marks]

Question 10

Consider the function, $g(x) = \dfrac{x}{7} + 3$

Find an expression for the inverse function $g^{-1}(x)$
HINT : Draw a flow diagram.

[3 marks]