Exercise 3.5

1. If s directly as u^2 and inversely as v and $s = 7$ when $u = 3, v = 2$. Find the value of s when $u = 6$ and $v = 10$.

Solution: *Given that* $s \propto \frac{u^2}{v}$

$$s = k\frac{u^2}{v} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Put $s = 7, u = 3, v = 2$ *in* (i), we get

$$7 = k\frac{(3)^2}{2}$$

$$7 = \frac{9k}{2}$$

$$\frac{7 \times 2}{9} = k$$

$$k = \frac{14}{9}$$

$$s = \frac{14u^2}{9v}$$

Now *Put* $u = 6, v = 10, k = \frac{14}{9}$ *in* (i), we get

$$s = \frac{14}{9} \times \frac{(6)^2}{10}$$

$$= \frac{14}{9} \times \frac{36}{10}$$

$$s = \frac{28}{5}$$

2. **If w varies jointly as x, y^2 and z and $w = 5$ when $x = 2, y = 3, z = 10$. Find w when $x = 4, y = 7$ and $z = 3$.**

Solution: *Given that* $w \propto xy^2z$

$$w = kxy^2z \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Put $w = 5, x = 2, y = 3, z = 10$ *in* (i), we get

$$5 = k(2)(3)^2(10)$$

$$5 = 180k$$

$$k = \frac{5}{180} = \frac{1}{36}$$

$$w = \frac{1}{36}xy^2z$$

Put $x = 4, y = 7, z = 3, k = \frac{1}{36}$ *in* (i)

$$w = \frac{1}{36}(4)(7)^2(3)$$

$$= \frac{1}{36} \times 4 \times 49 \times 3$$

$$w = \frac{49}{3}$$

3. **If y varies directly as x^3 and inversely as z^2 and t, and $y = 16$ when $x = 4, z = 2, t = 3$. Find the value of y when $x = 2, z = 3$ and $t = 4$.**

Solution: *Given that* $y \propto \frac{x^3}{z^2 t}$

$$y = \frac{kx^3}{z^2 t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Put $y = 16, x = 4, z = 2, t = 3$ *in* (i)

$$16 = \frac{k(4)^3}{(2)^2(3)}$$

$$16 = \frac{k \times 64}{4 \times 3}$$

$$16 = \frac{16k}{3}$$

$$k = 16 \times \frac{3}{16}$$

$$k = 3$$

$$y = \frac{3x^3}{z^2 t}$$

Put $x = 2, z = 3, t = 4, k = 3$ *in* (i), we get

$$y = \frac{3(2)^3}{(3)^2(4)}$$

$$= \frac{3 \times 8}{9 \times 4}$$

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

4. **If u varies directly as x^2 and inversely as the product yz^3, and $u = 2$ when $x = 8, y = 7\ z = 2$. Find the value of u when $x = 6, y = 3, z = 2$.**

Solution: *Given that* $u \propto \frac{x^2}{yz^3}$

$$u = \frac{kx^2}{yz^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Put $u = 2,\ x = 8,\ y = 7, z = 2$ *in* (i), we get

$$2 = \frac{k(8)^2}{7(2)^3}$$

$$k = \frac{2 \times 7}{8}$$

$$k = \frac{7}{4}$$

$$u = \frac{7x^2}{4yz^3}$$

Now, *Put* $x = 6, y = 3, z = 2, k = \frac{7}{4}$ *in* (i), we get

$$u = \frac{7(6)^2}{4(3)(2)^3}$$

$$= \frac{7 \times 6 \times 6}{4 \times 3 \times 8}$$

$$u = \frac{21}{8}$$

5. **If v varies directly as the product xy^3 and inversely as z^2 and v = 27 when $x = 7, y = 6, z = 7$. Find the value of v when $x = 6, y = 2, z = 3$.**

Solution: *Given that* $v \propto \frac{xy^3}{z^2}$

$$v = k\frac{xy^3}{z^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Put $v = 27, x = 7, y = 6, z = 7$

$$27 = \frac{k(7)(6)^3}{(7)^2}$$

$$27 = \frac{k(7)(6)(6)(6)}{7 \times 7}$$

$$k = \frac{27 \times 7}{6 \times 6 \times 6}$$

$$k = \frac{7}{8}$$

$$v = \frac{7xy^3}{8z^2}$$

Put $x = 6, y = 2, z = 3, k = \frac{7}{8}$ *in* (i), we get

$$v = \frac{7}{8} \times 6 \times \frac{(2)^3}{3^2}$$

$$= \frac{7}{8} \times 6 \times \frac{8}{9}$$

$$v = \frac{14}{3}$$

6. **If w varies inversely as the cube of u, and $w = 5$ when $u = 3$. Find w, when $u = 6$.**

Solution: *thus*

$$w = \frac{k}{u^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Put $w = 5, u = 3$ *in* (i), *we get*

$$5 = \frac{k}{(3)^2}$$

$$5 = \frac{k}{27}$$

$$k = 5 \times 27$$

$$k = 135$$

$$w = \frac{135}{u^3}$$

Put $u = 6, k = 135$ *in* (i), *we get*

$$w = \frac{135}{(6)^3}$$

$$= \frac{135}{6 \times 6 \times 6}$$

$$w = \frac{5}{8}$$