

# Inverse Proportion

“The light that burns twice as bright burns half as long – and you have burned so very, very brightly, Roy.”

BLADE RUNNER

Two quantities are in *inverse proportion* if, when one quantity gets *multiplied* by any factor, then the other quantity gets *divided* by the same factor. For example if one quantity is doubled then the other quantity is halved. We say that  $y \propto \frac{1}{x}$ .

## Questions

1. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |    |    |                 |    |                 |
|-----|----|----|-----------------|----|-----------------|
| $x$ | 8  | 24 |                 | 11 |                 |
| $y$ | 15 |    | $\frac{40}{13}$ |    | $\frac{260}{3}$ |

$39, \frac{18}{13}, 5, \frac{120}{11}$

2. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |    |     |                |                |                  |
|-----|----|-----|----------------|----------------|------------------|
| $x$ | 5  | 625 |                | $\frac{1}{35}$ | $\frac{2500}{3}$ |
| $y$ | 16 |     | $\frac{4}{15}$ |                |                  |

$300, \frac{16}{125}, 2800, \frac{12}{125}$

3. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                 |                 |                  |                    |
|-----|-----------------|-----------------|------------------|--------------------|
| $x$ | $\frac{11}{7}$  | $\frac{22}{91}$ |                  | $\frac{198}{1001}$ |
| $y$ | $\frac{18}{13}$ |                 | $\frac{99}{455}$ |                    |

10, 9, 11

4. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                 |                  |                    |                   |
|-----|-----------------|------------------|--------------------|-------------------|
| $x$ | $\frac{14}{19}$ |                  | $\frac{168}{7429}$ |                   |
| $y$ | $\frac{12}{23}$ | $\frac{21}{873}$ |                    | $\frac{28}{1321}$ |

$\frac{6984}{437}, \frac{7926}{437}, 17$

5. The variables  $p$  and  $q$  vary in inverse proportion. Copy and complete the following table.

|     |     |                |   |                |            |               |
|-----|-----|----------------|---|----------------|------------|---------------|
| $p$ | $x$ |                |   | $\frac{1}{81}$ |            | $\frac{1}{9}$ |
| $q$ | $y$ | $\frac{xy}{3}$ | 1 |                | $81x^2y^2$ |               |

$3, xy, \frac{1}{81xy}, 81xy, 9xy$

6.  $A$  and  $B$  are positive.  $A$  is inversely proportional to  $B$ . When  $A = 48$ ,  $B = 147$ . Find the value of  $A$  when  $A = B$ .

$A = 84$

7. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                 |   |       |     |               |
|-----|-----------------|---|-------|-----|---------------|
| $x$ | 1               |   |       | $b$ |               |
| $y$ | $\frac{b^2}{a}$ | 1 | $a^2$ |     | $\frac{1}{a}$ |

$$\frac{b^2}{a}, \frac{b^2}{a^3}, b^2, \frac{b}{a}$$

8. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |               |               |                |     |       |
|-----|---------------|---------------|----------------|-----|-------|
| $x$ | $\frac{7}{q}$ | $\frac{p}{q}$ |                | $q$ | $p^2$ |
| $y$ | $q^2$         |               | $\frac{7}{pq}$ |     |       |

$$pq^2, \frac{7q^2}{p}, 7, \frac{7q}{p^2}$$

9. The variables  $p$  and  $q$  vary in inverse proportion. Copy and complete the following table.

|     |           |             |              |
|-----|-----------|-------------|--------------|
| $p$ | $x^2 - 1$ | $(x + 1)^2$ |              |
| $q$ | $x + 1$   |             | $x(x + 1)^2$ |

$$\frac{x-1}{x}, x - 1$$

10. The variables  $M$  and  $t$  vary in inverse proportion. Copy and complete the following table.

|     |               |                   |               |
|-----|---------------|-------------------|---------------|
| $M$ | $x$           | $\frac{x^2 y}{2}$ |               |
| $t$ | $\frac{y}{x}$ |                   | $\frac{x}{y}$ |

$$\frac{y^2}{x}, \frac{2}{x^2}$$

11. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |             |      |                      |                 |
|-----|-------------|------|----------------------|-----------------|
| $x$ | $n$         |      | $\frac{n^2+n}{2n+4}$ | $10n^3 + 10n^2$ |
| $y$ | $5n^2 + 5n$ | $5n$ |                      |                 |

$$n(n + 1), 10n(n + 2), \frac{1}{2}$$

12. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |          |          |              |
|-----|----------|----------|--------------|
| $x$ | $r$      | $3r + 6$ |              |
| $y$ | $4r + 8$ |          | $12r^2 + 24$ |

$$\frac{r(r+2)}{3(r^2+2)}$$

13. The variables  $v$  and  $w$  vary in inverse proportion. Copy and complete the following table.

|     |         |             |                  |         |
|-----|---------|-------------|------------------|---------|
| $v$ | $x - y$ | $x^2 - y^2$ | $7qx^3 - 7qy^2x$ |         |
| $w$ | $7q$    |             |                  | $x - y$ |

$$7q, \frac{7q}{x+y}, \frac{1}{x(x+y)}$$

14. The variables  $p$  and  $q$  vary in inverse proportion. Copy and complete the following table.

|     |                            |                               |
|-----|----------------------------|-------------------------------|
| $p$ | $3\pi x$                   |                               |
| $q$ | $15\pi x + \frac{3\pi}{x}$ | $\frac{9\pi^2(5x^2+1)}{5x+1}$ |

$$5x + 1$$

15. The variables  $L$  and  $M$  vary in inverse proportion. Copy and complete the following table.

|     |          |           |
|-----|----------|-----------|
| $L$ | $xy - x$ | $y^2 - 1$ |
| $M$ | $y + 1$  |           |

x

16. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |        |       |                    |
|-----|--------|-------|--------------------|
| $x$ | $n$    | $n^3$ | $3n^{\frac{3}{2}}$ |
| $y$ | $3n^2$ |       |                    |

3,  $n^{\frac{3}{2}}$

17. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |      |         |                |                 |                   |
|-----|------|---------|----------------|-----------------|-------------------|
| $x$ | $2a$ |         |                | $\frac{a-b}{c}$ | $\frac{2}{a+b+c}$ |
| $y$ | $bc$ | $b + c$ | $\frac{ab}{c}$ |                 |                   |

$\frac{2abc}{b+c}, 2c^2, \frac{2abc^2}{a-b}, abc(a+b+c)$

18. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |     |                 |                   |        |
|-----|-----|-----------------|-------------------|--------|
| $x$ | $n$ |                 | $\frac{n^2+n}{m}$ |        |
| $y$ | $m$ | $\frac{m}{n+1}$ |                   | $nm^2$ |

$n(n+1), \frac{1}{m}, \frac{m^2}{n+1}$

19. The variables  $P$  and  $Q$  vary in inverse proportion. Copy and complete the following table.

|     |     |          |                   |              |                 |      |
|-----|-----|----------|-------------------|--------------|-----------------|------|
| $P$ | $x$ |          | $\frac{2xy}{x+4}$ | $x^2y + 2xy$ |                 | $xy$ |
| $Q$ | $y$ | $2x + 4$ |                   |              | $\frac{y}{x+2}$ |      |

$\frac{xy}{2(x+2)}, x(x+2), \frac{x+4}{2}, \frac{1}{x+2}, 1$

20. The variables  $r$  and  $s$  vary in inverse proportion. Copy and complete the following table.

|     |                     |            |
|-----|---------------------|------------|
| $r$ | $2xy - 4x - 3y + 6$ | $7y - 14$  |
| $s$ |                     | $14x - 21$ |

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21. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |              |              |
|-----|--------------|--------------|
| $x$ | $\pi^2 - 36$ |              |
| $y$ | 12           | $12\pi + 72$ |

$\pi - 6$

22. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                                  |       |
|-----|----------------------------------|-------|
| $x$ | $\sqrt{a}$                       | $b^2$ |
| $y$ | $\frac{a^{\frac{1}{2}}}{b^{-2}}$ |       |

$b^4$

23. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                                    |                   |
|-----|------------------------------------|-------------------|
| $x$ | $(\sqrt[3]{a})^2$                  | $b^{\frac{1}{2}}$ |
| $y$ | $\frac{a^{\frac{1}{3}}}{\sqrt{b}}$ |                   |

$$\frac{a}{b}$$

24. The variables  $P$  and  $Q$  vary in inverse proportion. Copy and complete the following table.

|     |          |                  |
|-----|----------|------------------|
| $P$ | $3x + 9$ | $5x^2 + 16x + 3$ |
| $Q$ | $5x + 1$ |                  |

$$3$$

25. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |           |           |
|-----|-----------|-----------|
| $x$ | $r^2 - r$ | $r^2 - 1$ |
| $y$ | $r - 1$   |           |

$$\frac{r(r-1)}{r+1}$$

26. The variables  $p$  and  $q$  vary in inverse proportion. Copy and complete the following table.

|     |   |       |
|-----|---|-------|
| $p$ | $\sqrt{x^5} + 6x^{\frac{3}{2}} + 9\sqrt{x}$ |       |
| $q$ | $2x^{\frac{3}{2}}$                          | $x^2$ |

$$2(x+3)^2$$

27. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |                |                     |                |
|-----|----------------|---------------------|----------------|
| $x$ | $a^2 - b^2$    | $2a^2 + 4ab + 2b^2$ |                |
| $y$ | $(a - b)^{-1}$ |                     | $(a + b)^{-1}$ |

$$(a + b)^2, \frac{1}{2(a+b)}$$

28. The variables  $p$  and  $q$  vary in inverse proportion. Copy and complete the following table.

|     |           |             |     |
|-----|-----------|-------------|-----|
| $p$ | $x^3 + x$ | $x^6 - x^2$ |     |
| $q$ | $x^2 - 1$ |             | $x$ |

$$x^4 - 1, \frac{1}{x}$$

29. The variables  $x$  and  $y$  vary in inverse proportion. Copy and complete the following table.

|     |       |             |
|-----|-------|-------------|
| $x$ | $r^2$ | $r^4 - r^2$ |
| $y$ |       | $r^2 + 1$   |

$$r^4 - 1$$