SOLVING EQUATIONS AND INEQUALITIES

(some of which have other unknowns).

In solving linear equations and inequalities, **there are only 4 processes which we need to apply:**

We can **ADD** something to **both sides**, **SUBTRACT** something from **both sides**, **MULTIPLY both sides** by something or **DIVIDE both sides** by something.

Find x in the four fundamental cases:

1(a) $x + 8 = 12$

(b) $x + k = w$

2(a) $x - 6 > 18$

(b) $x - k > w$

3(a) $4x = 12$

(b) $kx = w$

4(a) $\frac{x}{4} < 8$

(b) $\frac{x}{k} < w$

Use **combinations** of the above four techniques to solve the following equations or inequalities to find the x values.

5(a) $5x + 3 = 11$

(b) $px + v = m$

6(a) $\frac{x}{2} - 4 \leq 3$

(b) $\frac{x}{c} - t \leq v$

7(a) $7x - 4 = 3x + 11$

(b) $cx - b = nx + p$

8(a) $5(x + 4) \geq 3(x - 9)$

(b) $p(x + c) \geq v(x - d)$

9(a) $5(x + 3) + 2(x + 4) = 2(x + 15)$

(b) $c(x + p) + b(x + v) = d(x + a)$

10(a) $7(x - 2) - 3(x - 4) < 2(x - 5)$

(b) $a(x - b) - c(x - d) < e(x - f)$

11(a) $\frac{x}{2} + \frac{5}{3} > 7$

(b) $\frac{x}{5} + \frac{v}{2} > p$

12(a) $\frac{15}{(x - 2)} = 3$

(b) $\frac{p}{(x - b)} = c$

13(a) $\frac{12}{(x + 4)} = \frac{4}{x}$

(b) $\frac{b}{(x + v)} = \frac{c}{x}$

14(a) $\frac{7}{(x + 2)} = \frac{9}{(x - 3)}$

(b) $\frac{b}{(x + v)} = \frac{c}{(x - m)}$

MODEL SOLUTIONS

Find x in the four fundamental cases:

1(a) $x + 8 = 12$ *(subtract 8 from b.s.)*
$x = 4$

(b) $x + k = w$ *(subtract k from b.s.)*
$x = w - k$

2(a) $x - 6 > 18$ *(add 6 to b.s.)*
$x > 24$

(b) $x - k > w$ *(add k to b.s.)*
$x > w + k$

3(a) $4x = 12$ *(divide b.s. by 4)*
$x = 3$

(b) $kx = w$ *(divide b.s. by k)*
$x = \frac{w}{k}$

4(a) $\frac{x}{4} < 8$ *(multiply b.s. by 4)*
$x < 32$

(b) $\frac{x}{k} < w$ *(multiply b.s. by k)*
$x < kw$

Use **combinations** of the above four techniques to solve the following equations or inequalities to find the x values.

5(a) $5x + 3 = 11$
$5x = 8$
$x = \frac{8}{5}$

(b) $px + v = m$
$px = m - v$
$x = \frac{m - v}{p}$

6(a) $\frac{x}{2} - 4 \leq 3$
$\frac{x}{2} \leq 7$
$x \leq 14$

(b) $\frac{x}{c} - t \leq v$
$\frac{x}{c} \leq v + t$
$x \leq c(v + t)$

7(a) $7x - 4 = 3x + 11$
$4x - 4 = 11$
$4x = 15$
$x = \frac{15}{4}$

(b) $cx - b = nx + p$
$(c - n)x - b = p$
$(c - n)x = p + b$
$x = \frac{p + b}{(c - n)}$

8(a) $5(x + 4) \geq 3(x - 9)$
$5x + 20 \geq 3x - 27$
$2x + 20 \geq -27$
$2x \geq -47$
$x \geq \frac{-47}{2}$

(b) $p(x + c) \geq v(x - d)$
$px + pc \geq vx - vd$

$(p - v)x + pc \geq -vd$

$(p - v)x \geq -vd - pc$

$x \geq \frac{-vd - pc}{(p - v)}$

9(a) $5(x + 3) + 2(x + 4) = 2(x + 15)$

$5x + 15 + 2x + 8 = 2x + 30$

$5x + 23 = 30$

$5x = 7$

$x = \frac{7}{5}$

(b) $c(x + p) + b(x + v) = d(x + a)$

$cx + cp + bx + bv = dx + da$

$cx + bx - dx = da - cp - bv$

$x(c + b - d) = da - cp - bv$

$x = \frac{da - cp - bv}{(c + b - d)}$

10(a) $7(x - 2) - 3(x - 4) < 2(x - 5)$

$7x - 14 - 3x + 12 < 2x - 10$

$7x - 3x - 2x < -10 + 14 - 12$

$2x < -8$

$x < -4$

(b) $a(x - b) - c(x - d) < e(x - f)$

$ax - ab - cx + cd < ex - ef$

$ax - cx - ex < -ef + ab - cd$

$x(a - c - e) < -ef + ab - cd$

$x < \frac{-ef + ab - cd}{(a - c - e)}$

11(a) $\frac{x}{2} + \frac{5}{3} > 7$

$6\left(\frac{x}{2} + \frac{5}{3}\right) > 6 \times 7$

$3x + 10 > 42$

$3x > 32$

$x > \frac{32}{3}$

(b) $\frac{x}{5} + \frac{v}{2} > p$

$10\left(\frac{x}{5} + \frac{v}{2}\right) > 10p$

$2x + 5v > 10p$

$2x > 10p - 5v$

$x > \frac{10p - 5v}{2}$

12(a) $\frac{15}{(x - 2)} = 3$

$\frac{15}{3} = x - 2$

$5 = x - 2$

$7 = x$

(b) $\frac{p}{(x - b)} = c$

$\frac{p}{c} = x - b$

$\frac{p}{c} + b = x$

13(a) $\frac{12}{(x + 4)} = \frac{4}{x}$

$12x = 4x + 16$

$8x = 16$

$x = 2$

(b) $\frac{b}{(x + v)} = \frac{c}{x}$

$bx = cx + cv$

$bx - cx = cv$

$x(b - c) = cv$

$x = \frac{cv}{(b - c)}$

14(a) $\frac{7}{(x + 2)} = \frac{9}{(x - 3)}$

$7x - 21 = 9x + 18$

$-21 = 2x + 18$

$-39 = 2x$

$\frac{-39}{2} = x$

(b) $\frac{b}{(x + v)} = \frac{c}{(x - m)}$

$bx - bm = cx + cv$

$bx - cx = cv + bm$

$x(b - c) = cv + bm$

$x = \frac{cv + bm}{(b - c)}$
