**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) x < 8***

***4***

***(b) x < w***

***k***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

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) x – 4 ≤ 3***

***2***

***(b) x – t ≤ v***

***c***

***7(a) 7x – 4 = 3x + 11***

***(b) cx – b = nx + p***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***8(a) 5(x + 4) ≥ 3(x – 9)***

***(b) p(x + c) ≥ 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) x + 5 > 7***

***2 3***

***(b) x + v > p***

***5 2***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***12(a) 15 = 3***

***(x – 2)***

***(b) p = c***

***(x – b)***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***13(a) 12 = 4***

***(x + 4) x***

***(b) b = c***

***(x + v) x***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***14(a) 7 = 9 .***

***(x + 2) (x – 3)***

***(b) b = c .***

***(x + v) (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 = w***

***k***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***4(a) x < 8 (multiply b.s. by 4)***

***4***

***x < 32***

***(b) x < w (multiply b.s. by k)***

***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 = 8***

***5***

***(b) px + v = m***

***px = m – v***

***x = m – v***

***p***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***6(a) x – 4 ≤ 3***

***2***

***x ≤ 7***

***2***

***x ≤ 14***

***(b) x – t ≤ v***

***c***

***x ≤ v + t***

***c***

***x ≤ c(v + t)***

***7(a) 7x – 4 = 3x + 11***

***4x – 4 = 11***

***4x = 15***

***x = 15***

***4***

***(b) cx – b = nx + p***

***(c – n)x – b = p***

***(c – n)x = p + b***

***x = p + b***

***( c – n)***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***8(a) 5(x + 4) ≥ 3(x – 9)***

***5x + 20 ≥ 3x – 27***

***2x + 20 ≥ - 27***

***2x ≥ - 47***

***x ≥ - 47***

***2***

***(b) p(x + c) ≥ v(x – d)***

***px + pc ≥ vx – vd***

***(p – v)x + pc ≥ - vd***

***(p – v)x ≥ - vd – pc***

***x ≥ -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 = 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 = 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 < -ef + ab – cd***

***(a – c – e )***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***11(a) x + 5 > 7***

***2 3***

***6 ( x + 5 ) > 6× 7***

***2 3***

***3x + 10 > 42***

***3x > 32***

***x > 32***

***3***

***(b) x + v > p***

***5 2***

***10( x + v ) > 10p***

***5 2***

***2x + 5v > 10p***

***2x > 10p – 5v***

***x > 10p – 5v***

***2***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***12(a) 15 = 3***

***(x – 2)***

***15 = x – 2***

***3***

***5 = x – 2***

***7 = x***

***(b) p = c***

***(x – b)***

***p = x – b***

***c***

***p + b = x***

***c***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***13(a) 12 = 4***

***(x + 4) x***

***12x = 4x + 16***

***8x = 16***

***x = 2***

***(b) b = c***

***(x + v) x***

***bx = cx + cv***

***bx – cx = cv***

***x(b – c) = cv***

***x = cv ,***

***(b – c)***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***14(a) 7 = 9 .***

***(x + 2) (x – 3)***

***7x – 21 = 9x + 18***

***- 21 = 2x + 18***

***- 39 = 2x***

***- 39 = x***

***2***

***(b) b = c .***

***(x + v) (x – m)***

***bx – bm = cx + cv***

***bx – cx = cv + bm***

***x(b – c) = cv + bm***

***x = cv + bm***

***(b – c)***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***