EXERCISE 9.2

Solve each of the following equations and also check your results in each case:

1. (2x+5)/3 = 3x – 10
Solution:
(2x+5)/3 = 3x – 10
Let us simplify,
(2x+5)/3 - 3x = – 10
By taking LCM
(2x + 5 – 9x)/3 = -10
(-7x + 5)/3 = -10
By using cross-multiplication we get,
-7x + 5 = -30
-7x = -30 – 5
-7x = -35
x = -35/-7
= 5

Let us verify the given equation now,
(2x+5)/3 = 3x – 10
By substituting the value of 'x' we get,
(2×5 + 5)/3 = 3(5) – 10
(10+5)/3 = 15-10
15/3 = 5
5 = 5
Hence, the given equation is verified

2. (a-8)/3 = (a-3)/2
Solution:
(a-8)/3 = (a-3)/2
By using cross-multiplication we get,
(a-8)2 = (a-3)3
2a - 16 = 3a – 9
2a – 3a = -9 + 16
-a = 7
a = -7

Let us verify the given equation now,

(a-8)/3 = (a-3)/2
By substituting the value of 'a' we get,
(-7 - 8)/3 = (-7 - 3)/2
-15/3 = -10/2
-5 = -5
Hence, the given equation is verified

3. (7y + 2)/5 = (6y - 5)/11
Solution:
(7y + 2)/5 = (6y - 5)/11
By using cross-multiplication we get,
(7y + 2)11 = (6y - 5)5
77y + 22 = 30y – 25
77y – 30y = -25 – 22
47y = -47
y = -47/47
y = -1

Let us verify the given equation now,
(7y + 2)/5 = (6y - 5)/11
By substituting the value of 'y' we get,
(7(-1) + 2)/5 = (6(-1) - 5)/11
(-7 + 2)/5 = (-6 - 5)/11
-5/5 = -11/11
-1 = -1
Hence, the given equation is verified

4. x – 2x + 2 – 16/3x + 5 = 3 – 7/2x
Solution:
x – 2x + 2 – 16/3x + 5 = 3 – 7/2x
Let us rearrange the equation
x – 2x – 16x/3 + 7x/2 = 3 – 2 – 5
By taking LCM for 2 and 3 which is 6
(6x – 12x – 32x + 21x)/6 = -4
-17x/6 = -4
By cross-multiplying
-17x = -4×6
-17x = -24
x = -24/-17

x = 24/17

Let us verify the given equation now,
x – 2x + 2 – 16/3x + 5 = 3 – 7/2x
By substituting the value of 'x' we get,
24/17 – 2(24/17) + 2 – (16/3)(24/17) + 5 = 3 – (7/2)(24/17)
24/17 – 48/17 + 2 – 384/51 + 5 = 3 – 168/34
By taking 51 and 17 as the LCM we get,
(72 – 144 + 102 – 384 + 255)/51 = (102 – 168)/34
-99/51 = -66/34
-33/17 = -33/17
Hence, the given equation is verified

5. 1/2x + 7x – 6 = 7x + 1/4
Solution:
1/2x + 7x – 6 = 7x + 1/4
Let us rearrange the equation
1/2x + 7x – 7x = 1/4 + 6 (by taking LCM)
1/2x = (1+ 24)/4
1/2x = 25/4
By cross-multiplying
4x = 25 × 2
4x = 50
x = 50/4
x = 25/2

Let us verify the given equation now,
1/2x + 7x – 6 = 7x + 1/4
By substituting the value of 'x' we get,
(1/2) (25/2) + 7(25/2) – 6 = 7(25/2) + 1/4
25/4 + 175/2 – 6 = 175/2 + 1/4
By taking LCM for 4 and 2 is 4
(25 + 350 – 24)/4 = (350+1)/4
351/4 = 351/4
Hence, the given equation is verified

6. 3/4x + 4x = 7/8 + 6x – 6
Solution:
3/4x + 4x = 7/8 + 6x – 6

Let us rearrange the equation
3/4x + 4x – 6x = 7/8 – 6
By taking 4 and 8 as LCM
(3x + 16x – 24x)/4 = (7 - 48)/8
-5x/4 = -41/8
By cross-multiplying
-5x(8) = -41(4)
-40x = -164
x = -164/-40
= 82/20
= 41/10

Let us verify the given equation now,
3/4x + 4x = 7/8 + 6x – 6
By substituting the value of 'x' we get,
(3/4)(41/10) + 4(41/10) = 7/8 + 6(41/10) – 6
123/40 + 164/10 = 7/8 + 246/10 – 6
(123 + 656)/40 = (70 + 1968 - 480)/80
779/40 = 1558/80
779/40 = 779/40
Hence, the given equation is verified

7. 7x/2 – 5x/2 = 20x/3 + 10
Solution:
7x/2 – 5x/2 = 20x/3 + 10
Let us rearrange the equation
7x/2 – 5x/2 – 20x/3 = 10
By taking LCM for 2 and 3 is 6
(21x – 15x – 40x)/6 = 10
-34x/6 = 10
By cross-multiplying
-34x = 60
x = 60/-34
= -30/17

Let us verify the given equation now,
7x/2 – 5x/2 = 20x/3 + 10
By substituting the value of 'x' we get,
(7-/2)(-30/17) – (5/2)(-30/17) = (20/3)(-30/17) + 10

-210/34 +150/34 = -600/51 + 10
-30/17 = (-600+510)/51
= -90/51
-30/17 = -30/17
Hence, the given equation is verified

8. (6x+1)/2 + 1 = (7x-3)/3
Solution:
(6x+1)/2 + 1 = (7x-3)/3
(6x + 1 + 2)/2 = (7x - 3)/3
By cross-multiplying
(6x + 3)3 = (7x - 3)2
18x + 9 = 14x – 6
18x – 14x = -6 – 9
4x = -15
x = -15/4

Let us verify the given equation now,
(6x+1)/2 + 1 = (7x-3)/3
By substituting the value of 'x' we get,
(6(-15/4) + 1)/2 + 1 = (7(-15/4) – 3)/3
(3(-15/2) + 1)/2 + 1 = (-105/4 -3)/3
(-45/2 + 1)/2 + 1 = (-117/4)/3
(-43/4) + 1 = -117/12
(-43+4)/4 = -39/4
-39/4 = -39/4
Hence, the given equation is verified

9. (3a-2)/3 + (2a+3)/2 = a + 7/6
Solution:
(3a-2)/3 + (2a+3)/2 = a + 7/6
Let us rearrange the equation
(3a-2)/3 + (2a+3)/2 – a = 7/6
By taking LCM for 2 and 3 which is 6
((3a-2)2 + (2a+3)3 – 6a)/6 = 7/6
(6a – 4 + 6a + 9 – 6a)/6 = 7/6
(6a + 5)/6 = 7/6
6a + 5 = 7
6a = 7-5

6a = 2
a = 2/6
a = 1/3

Let us verify the given equation now,
(3a-2)/3 + (2a+3)/2 = a + 7/6
By substituting the value of 'a' we get,
(3(1/3)-2)/3 + (2(1/3) + 3)/2 = 1/3 + 7/6
(1-2)/3 + (2/3 + 3)/2 = (2+7)/6
-1/3 + (11/3)/2 = 9/6
-1/3 + 11/6 = 3/2
(-2+11)/6 = 3/2
9/6 = 3/2
3/2 = 3/2
Hence, the given equation is verified

10. x – (x-1)/2 = 1 – (x-2)/3
Solution:
x – (x-1)/2 = 1 – (x-2)/3
Let us rearrange the equation
x – (x-1)/2 + (x-2)/3 = 1
By taking LCM for 2 and 3 which is 6
(6x – (x-1)3 + (x-2)2)/6 = 1
(6x – 3x + 3 + 2x - 4)/6 = 1
(5x - 1)/6 = 1
By cross-multiplying
5x – 1 = 6
5x = 6 + 1
x = 7/5

Let us verify the given equation now,
x – (x-1)/2 = 1 – (x-2)/3
By substituting the value of 'x' we get,
7/5 – (7/5 - 1)/2 = 1 – (7/5 - 2)/3
7/5 – (2/5)/2 = 1 – (-3/5)/3
7/5 – 2/10 = 1 + 3/15
(14 - 2)/10 = (15+3)/15
12/10 = 18/15
6/5 = 6/5

Hence, the given equation is verified

11. 3x/4 – (x-1)/2 = (x-2)/3
Solution:
3x/4 – (x-1)/2 = (x-2)/3
Let us rearrange the equation
3x/4 – (x-1)/2 - (x-2)/3 = 0
By taking LCM for 4, 2 and 3 which is 12
(9x – (x-1)6 – (x-2)4)/12 = 0
(9x – 6x + 6 – 4x + 8)/12 = 0
(-x + 14)/12 = 0
By cross-multiplying
-x + 14 = 0
x = 14

Let us verify the given equation now,
3x/4 – (x-1)/2 = (x-2)/3
By substituting the value of 'x' we get,
3(14)/4 – (14-1)/2 = (14-2)/3
42/4 – 13/2 = 12/3
(42 - 26)/4 = 4
16/4 = 4
4 = 4
Hence, the given equation is verified

12. 5x/3 – (x-1)/4 = (x-3)/5
Solution:
5x/3 – (x-1)/4 = (x-3)/5
Let us rearrange the equation
5x/3 – (x-1)/4 - (x-3)/5 = 0
By taking LCM for 3, 4 and 5 which is 60
((5x×20) – (x-1)15 – (x-3)12)/60 = 0
(100x – 15x + 15 -12x + 36)/60 = 0
(73x + 51)/60 = 0
By cross-multiplying
73x + 51 = 0
x = -51/73

Let us verify the given equation now,

5x/3 – (x-1)/4 = (x-3)/5
By substituting the value of 'x' we get,
(20x – (x-1)3)/12 = (-51/73 - 3)/5
(20x – 3x + 3)/12 = (-270/73)/5
(17x + 3)/12 = -270/365
(17(-51/73) + 3)/12 = -54/73
(-867/73 + 3)/12 = -54/73
((-867 + 219)/73)/12 = -54/73
(-648)/876 = -54/73
-54/73 = -54/73
Hence, the given equation is verified

13. (3x+1)/16 + (2x-3)/7 = (x+3)/8 + (3x-1)/14
Solution:
(3x+1)/16 + (2x-3)/7 = (x+3)/8 + (3x-1)/14
Let us rearrange the equation
(3x+1)/16 + (2x-3)/7 - (x+3)/8 - (3x-1)/14 = 0
By taking LCM for 16, 7, 8 and 14 which is 112
((3x+1)7 + (2x-3)16 - (x+3)14 - (3x-1)8)/112 = 0
(21x + 7 + 32x – 48 – 14x – 42 – 24x + 8)/112 = 0
(21x + 32x – 14x – 24x + 7 – 48 - 42 + 8)/112 = 0
(15x – 75)/112 = 0
By cross-multiplying
15x – 75 = 0
15x = 75
x = 75/15
= 5

Let us verify the given equation now,
(3x+1)/16 + (2x-3)/7 = (x+3)/8 + (3x-1)/14
By substituting the value of 'x' we get,
(3(5)+1)/16 + (2(5)-3)/7 = (5+3)/8 + (3(5)-1)/14
(15+1)/16 + (10-3)/7 = 8/8 + (15-1)/14
16/16 + 7/7 = 8/8 + 14/14
1 + 1 = 1 + 1
2 = 2
Hence, the given equation is verified

14. (1-2x)/7 – (2-3x)/8 = 3/2 + x/4

Solution:

(1-2x)/7 – (2-3x)/8 = 3/2 + x/4

Let us rearrange the equation

(1-2x)/7 – (2-3x)/8 - x/4 = 3/2

By taking LCM for 7, 8 and 4 which is 56

((1-2x)8 – (2-3x)7 - 14x)/56 = 3/2

(8 – 16x – 14 + 21x – 14x)/56 = 3/2

(-9x – 6)/56 = 3/2

By cross-multiplying

2(-9x-6) = 3(56)

-18x – 12 = 168

-18x = 168+12

-18x = 180

x = 180/-18

x = -10

Let us verify the given equation now,

(1-2x)/7 – (2-3x)/8 = 3/2 + x/4

By substituting the value of 'x' we get,

(1-2(-10))/7 – (2-3(-10))/8 = 3/2 + (-10)/4

(1+20)/7 – (2+30)/8 = 3/2 - 5/2

21/7 – 32/8 = 3/2 – 5/2

3 – 4 = -2/2

-1 = -1

Hence, the given equation is verified

15. (9x+7)/2 – (x – (x-2)/7) = 36

Solution:

(9x+7)/2 – (x – (x-2)/7) = 36

Let us simplify the given equation into simple form

(9x+7)/2 – (7x-x+2)/7 = 36

(9x+7)/2 – (6x+2)/7 = 36

By taking LCM for 2 and 7 is 14

(7(9x+7) – 2(6x+2))/14 = 36

(63x+49 – 12x - 4)/14 = 36

(51x + 45)/14 = 36

By cross-multiplying

51x + 45 = 36(14)

51x + 45 = 504
51x = 504-45
51x = 459
x = 459/51
= 9

Let us verify the given equation now,
(9x+7)/2 – (x – (x-2)/7) = 36
(9x+7)/2 – (6x+2)/7 = 36
By substituting the value of 'x' we get,
(9(9)+7)/2 – (6(9)+2)/7 = 36
(81+7)/2 – (54+2)/7 = 36
88/2 – 56/7 = 36
44 – 8 = 36
36 = 36
Hence, the given equation is verified

16. 0.18(5x - 4) = 0.5x + 0.8
Solution:
0.18(5x - 4) = 0.5x + 0.8
Let us rearrange the equation
0.18(5x - 4) - 0.5x = 0.8
0.90x – 0.72 – 0.5x = 0.8
0.90x – 0.5x = 0.8 + 0.72
0.40x = 1.52
x = 1.52/0.40
= 3.8

Let us verify the given equation now,
0.18(5x - 4) = 0.5x + 0.8
By substituting the value of 'x' we get,
0.18(5(3.8)-4) = 0.5(3.8) + 0.8
0.18(19-4) = 1.9 + 0.8
2.7 = 2.7
Hence, the given equation is verified

17. 2/3x – 3/2x = 1/12
Solution:
2/3x – 3/2x = 1/12

By taking LCM for 3x and 2x which is 6x
((2×2) – (3×3))/6x = 1/12
(4-9)/6x = 1/12
-5/6x = 1/12
By cross-multiplying
6x = -60
x = -60/6
= -10

Let us verify the given equation now,
2/3x – 3/2x = 1/12
By substituting the value of 'x' we get,
2/3(-10) – 3/2(-10) = 1/12
-2/30 + 3/20 = 1/12
((-2×2) + (3×3))/60 = 1/12
(-4+9)/60 = 1/12
5/60 = 1/12
1/12 = 1/12
Hence, the given equation is verified

18. 4x/9 + 1/3 + 13x/108 = (8x+19)/18
Solution:
4x/9 + 1/3 + 13x/108 = (8x+19)/18
Let us rearrange the equation
4x/9 + 13x/108 - (8x+19)/18 = -1/3
By taking LCM for 9, 108 and 18 which is 108
((4x×12) + 13x×1 – (8x+19)6)/108 = -1/3
(48x + 13x – 48x – 114)/108 = -1/3
(13x - 114)/108 = -1/3
By cross-multiplying
(13x – 114)3 = -108
39x – 342 = -108
39x = -108 + 342
39x = 234
x = 234/39
= 6

Let us verify the given equation now,
4x/9 + 1/3 + 13x/108 = (8x+19)/18

By substituting the value of ‘x’ we get,
4(6)/9 + 1/3 + 13(6)/108 = (8(6)+19)/18
24/9 + 1/3 + 78/108 = 67/18
8/3 + 1/3 + 13/18 = 67/18
((8×6) + (1×6) + (13×1))/18 = 67/18
(48 + 6 + 13)/18 = 67/18
67/18 = 67/18
Hence, the given equation is verified

19. (45-2x)/15 – (4x+10)/5 = (15-14x)/9
Solution:
(45-2x)/15 – (4x+10)/5 = (15-14x)/9
By rearranging
(45-2x)/15 – (4x+10)/5 - (15-14x)/9 = 0
By taking LCM for 15, 5 and 9 which is 45
((45-2x)3 – (4x+10)9 – (15-14x)5)/45 = 0
(135 – 6x – 36x – 90 – 75 + 70x)/45 = 0
(28x – 30)/45 = 0
By cross-multiplying
28x – 30 = 0
28x = 30
x = 30/28
= 15/14

Let us verify the given equation now,
(45-2x)/15 – (4x+10)/5 = (15-14x)/9
By substituting the value of ‘x’ we get,
(45-2(15/14))/15 – (4(15/14) + 10)/5 = (15 – 14(15/14))/9
(45- 15/7)/15 – (30/7 + 10)/5 = (15-15)/9
300/105 – 100/35 = 0
(300-300)/105 = 0
0 = 0
Hence, the given equation is verified

20. 5(7x+5)/3 – 23/3 = 13 – (4x-2)/3
Solution:
5(7x+5)/3 – 23/3 = 13 – (4x-2)/3
By rearranging
(35x + 25)/3 + (4x - 2)/3 = 13 + 23/3

(35x + 25 + 4x - 2)/3 = (39+23)/3
(39x + 23)/3 = 62/3
By cross-multiplying
(39x + 23)3 = 62(3)
39x + 23 = 62
39x = 62 – 23
39x = 39
x = 1

Let us verify the given equation now,
5(7x+5)/3 – 23/3 = 13 – (4x-2)/3
By substituting the value of 'x' we get,
(35x + 25)/3 – 23/3 = 13 – (4x-2)/3
(35+25)/3 – 23/3 = 13 – (4-2)/3
60/3 – 23/3 = 13 – 2/3
(60-23)/3 = (39-2)/3
37/3 = 37/3
Hence, the given equation is verified

21. (7x-1)/4 – 1/3(2x – (1-x)/2) = 10/3
Solution:
(7x-1)/4 – 1/3(2x – (1-x)/2) = 10/3
Upon expansion
(7x-1)/4 – (4x-1+x)/6 = 10/3
(7x-1)/4 – (5x-1)/6 = 10/3
By taking LCM for 4 and 6 is 24
((7x-1)6 – (5x-1)4)/24 = 10/3
(42x – 6 - 20x + 4)/24 = 10/3
(22x - 2)/24 = 10/3
By cross-multiplying
22x – 2 = 10(8)
22x – 2 = 80
22x = 80+2
22x = 82
x = 82/22
= 41/11

Let us verify the given equation now,
(7x-1)/4 – 1/3(2x – (1-x)/2) = 10/3

By substituting the value of 'x' we get,
(7x-1)/4 – (5x-1)/6 = 10/3
(7(41/11)-1)/4 – (5(41/11)-1)/6 = 10/3
(287/11 - 1)/4 – (205/11 - 1)/6 = 10/3
(287-11)/44 – (205-11)/66 = 10/3
276/44 – 194/66 = 10/3
69/11 – 97/33 = 10/3
((69×3) – (97×1))/33 = 10/3
(207 – 97)/33 = 10/3
110/33 = 10/3
10/3 = 10/3
Hence, the given equation is verified

22. 0.5(x-0.4)/0.35 – 0.6(x-2.71)/0.42 = x + 6.1
Solution:
0.5(x-0.4)/0.35 – 0.6(x-2.71)/0.42 = x + 6.1
Let us simplify
(0.5/0.35)(x – 0.4) – (0.6/0.42)(x – 2.71) = x + 6.1
(x – 0.4)/0.7 – (x – 2.71)/0.7 = x + 6.1
(x – 0.4 – x + 2.71)/0.7 = x + 6.1
-0.4 + 2.71 = 0.7(x + 6.1)
0.7x = 2.71 – 0.4 – 4.27
= -1.96
x = -1.96/0.7
= -2.8

Let us verify the given equation now,
0.5(x-0.4)/0.35 – 0.6(x-2.71)/0.42 = x + 6.1
By substituting the value of 'x' we get,
0.5(-2.8 – 0.4)/0.35 – 0.6(-2.8 – 2.71)/0.42 = -2.8 + 6.1
-1.6/0.35 + 3.306/0.42 = 3.3
-4.571 + 7.871 = 3.3
3.3 = 3.3
Hence, the given equation is verified

23. 6.5x + (19.5x – 32.5)/2 = 6.5x + 13 + (13x - 26)/2
Solution:
6.5x + (19.5x – 32.5)/2 = 6.5x + 13 + (13x - 26)/2
By rearranging

6.5x + (19.5x – 32.5)/2 - 6.5x - (13x - 26)/2 = 13
(19.5x – 32.5)/2 - (13x - 26)/2 = 13
(19.5x – 32.5 – 13x + 26)/2 = 13
(6.5x – 6.5)/2 = 13
6.5x – 6.5 = 13×2
6.5x – 6.5 = 26
6.5x = 26+6.5
6.5x = 32.5
x = 32.5/6.5
= 5

Let us verify the given equation now,
6.5x + (19.5x – 32.5)/2 = 6.5x + 13 + (13x - 26)/2
By substituting the value of 'x' we get,
6.5(5) + (19.5(5) – 32.5)/2 = 6.5(5) + 13 + (13(5) - 26)/2
32.5 + (97.5 – 32.5)/2 = 32.5 + 13 + (65 - 26)/2
32.5 + 65/2 = 45.5 + 39/2
(65 + 65)/2 = (91+39)/2
130/2 = 130/2
65 = 65
Hence, the given equation is verified

24. (3x - 8) (3x + 2) – (4x - 11) (2x + 1) = (x - 3) (x + 7)
Solution:
(3x - 8) (3x + 2) – (4x - 11) (2x + 1) = (x - 3) (x + 7)
Let us simplify
$9x^2 + 6x – 24x – 16 – 8x^2 – 4x + 22x + 11 = x^2 + 7x – 3x – 21$
$9x^2 + 6x – 24x – 16 – 8x^2 – 4x + 22x + 11 - x^2 - 7x + 3x + 21 = 0$
$9x^2 - 8x^2 – x^2 + 6x – 24x – 4x + 22x – 7x + 3x – 16 + 21 + 11 = 0$
-4x + 16 = 0
-4x = -16
x = 4

Let us verify the given equation now,
(3x - 8) (3x + 2) – (4x - 11) (2x + 1) = (x - 3) (x + 7)
By substituting the value of 'x' we get,
(3(4) - 8) (3(4) + 2) – (4(4) - 11) (2(4) + 1) = (4 - 3) (4 + 7)
(12-8) (12+2) – (16-11) (8+1) = 1(11)
4 (14) – 5(9) = 11

56 – 45 = 11
11 = 11
Hence, the given equation is verified

25. $[(2x+3) + (x+5)]^2 + [(2x+3) – (x+5)]^2 = 10x^2 + 92$
Solution:
$[(2x+3) + (x+5)]^2 + [(2x+3) – (x+5)]^2 = 10x^2 + 92$
Let us simplify the given equation
$[3x + 8]^2 + [x - 2]^2 = 10x^2 + 92$
By using the formula $(a+b)^2$
$9x^2 + 48x + 64 + x^2 – 4x + 4 = 10x^2 + 92$
By rearranging
$9x^2 – 10x^2 + x^2 + 48x – 4x = 92 – 64 – 4$
$44x = 24$
$x = 24/44$
$= 6/11$

Let us verify the given equation now,
$[(2x+3) + (x+5)]^2 + [(2x+3) – (x+5)]^2 = 10x^2 + 92$
By substituting the value of ‘x’ we get,
$[2(6/11) + 3 + (6/11) + 5]^2 + [2(6/11) + 3 – (6/11) - 5]^2 = 10(6/11)^2 + 92$
$[(12/11 + 3) + (6/11 + 5)]^2 + [(12/11 + 3) – (6/11 + 5)]^2 = 10(6/11)^2 + 92$
$[(12+33)/11 + (6+55)/11]^2 + [(12+33)/11- (6+55)/11]^2 = 10(6/11)^2 + 92$
$[(45/11)+ (61/11)]^2 + [(45/11) – (61/11)]^2 = 360/121 + 92$
$(106/11)^2 + (-16/11)^2 = (360 + 11132)/121$
$11236/121 + 256/121 = 11492/121$
$11492/121 = 11492/121$
Hence, the given equation is verified