

$$\begin{aligned}
45. & (x^2 + (-4) \cdot x) + 1 \cdot x = x^2 + ((-4) \cdot x + 1 \cdot x) \quad (A2) \\
46. & x^2 = x \cdot x \quad (\text{Defn}) \quad 47. x^2 + (-4) \cdot x = x \cdot x + (-4) \cdot x \quad (\text{Substitute eq 46}) \\
48. & (x^2 + (-4) \cdot x) + 1 \cdot x = (x \cdot x + (-4) \cdot x) + 1 \cdot x \quad (\text{Substitute eq 47}) \\
49. & \cancel{(x^2 + (-4) \cdot x) + 1 \cdot x} + 1 \cdot x = (x^2 + (-4) \cdot x) + 1 \cdot x \quad (\text{Symmetry of eq 45}) \\
50. & x^2 + ((-4) \cdot x + 1 \cdot x) = (x \cdot x + (-4) \cdot x) + 1 \cdot x \quad (\text{Transitivity of eq 49, 48}) \\
51. & (x \cdot x + (-4) \cdot x) + 1 \cdot x = x^2 + ((-4) \cdot x + 1 \cdot x) \quad (\text{Symmetry of eq 50}) \\
52. & (x \cdot x + (-4) \cdot x) + 1 \cdot x = x^2 + (-1) \cdot (3 \cdot x) \quad (\text{Transitivity of eq on 51, 44}) \\
53. & ((x \cdot x + (-4) \cdot x) + 1 \cdot x) + (-4) = (x^2 + (-1) \cdot (3 \cdot x)) + (-4) \quad (\text{Substitute eq 52}) \\
54. & ((x \cdot x + (-4) \cdot x) + 1 \cdot x) + (-4) = (x \cdot x + (-4) \cdot x) + (1 \cdot x + (-4)) \quad (A2) \\
55. & \cancel{x \cdot (x + (-4))} = \cancel{x \cdot x} + (-4) \cdot x = x \cdot x + (-4) \cdot x \quad (D) \\
56. & (x + (-4)) \cdot x + (1 \cdot x + (-4)) = (x \cdot x + (-4) \cdot x) + (1 \cdot x + (-4)) \quad (\text{Substitute eq 55}) \\
57. & 1 \cdot x = x \quad (M3) \quad 58. 1 \cdot x + (-4) = x + (-4) \quad (\text{Substitute eq 57}) \\
59. & x + (-4) = 1 \cdot (x + (-4)) \quad (M3) \quad 60. 1 \cdot x + (-4) = 1 \cdot (x + (-4)) \quad (\text{Transitivity of eq on 58, 59}) \\
61. & 1 \cdot (x + (-4)) = (x + (-4)) \cdot 1 \quad (M1) \quad 62. 1 \cdot x + (-4) = (x + (-4)) \cdot 1 \quad (\text{Transitivity of eq on 60, 61}) \\
63. & (x + (-4)) \cdot x + (1 \cdot x + (-4)) = (x + (-4)) \cdot x + (x + (-4)) \cdot 1 \quad (\text{Substitute eq 62}) \\
64. & (x + (-4)) \cdot (x + 1) = (x + (-4)) \cdot x + (x + (-4)) \cdot 1 \quad (D) \\
65. & (x + (-4)) \cdot x + (x + (-4)) \cdot 1 = (x + (-4)) \cdot (x + 1) \quad (\text{Symmetry of eq 64}) \\
66. & (x + (-4)) \cdot x + (1 \cdot x + (-4)) = (x + (-4)) \cdot (x + 1) \quad (\text{Transitivity of eq on 63, 65}) \\
67. & \cancel{(x \cdot x + (-4) \cdot x) + (1 \cdot x + (-4))} = \cancel{(x \cdot x + (-4) \cdot x) + 1 \cdot x} + (-4) \\
67. & (x + (-4)) \cdot (x + 1) = (x + (-4)) \cdot x + (1 \cdot x + (-4)) \quad (\text{Symmetry of eq 66}) \\
68. & (x + (-4)) \cdot (x + 1) = (x \cdot x + (-4) \cdot x) + (1 \cdot x + (-4)) \quad (\text{Substitute eq 67, 56}) \\
69. & (x \cdot x + (-4) \cdot x) + (1 \cdot x + (-4)) = (x + (-4)) \cdot x + (1 \cdot x + (-4)) \quad (\text{Symmetry of eq 56}) \\
70. & (x + (-4)) \cdot (x + 1) = (x + (-4)) \cdot x + (1 \cdot x + (-4)) \quad (\text{Transitivity of eq on 68, 69}) \\
71. & ((x \cdot x + (-4) \cdot x) + 1 \cdot x) + (-4) = (x + (-4)) \cdot x + (1 \cdot x + (-4)) \quad (\text{Transitivity of eq on 54, 69}) \\
72. & (x^2 + (-1) \cdot (3 \cdot x)) + (-4) = ((x \cdot x + (-4) \cdot x) + 1 \cdot x) + (-4) \quad (\text{Symmetry of eq 53})
\end{aligned}$$