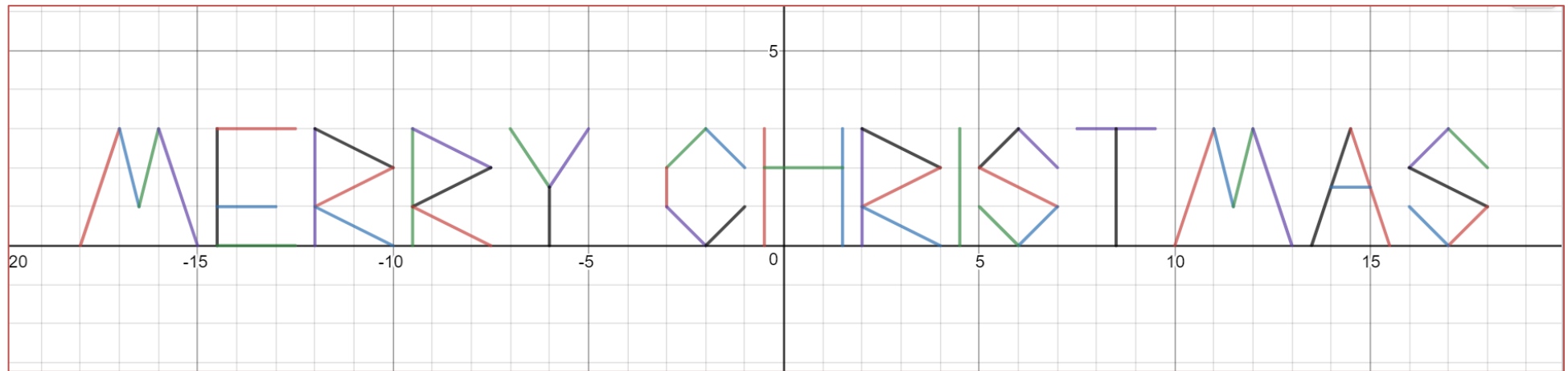


A: Straight Lines

Using your knowledge of straight lines, decode this message algebraically.

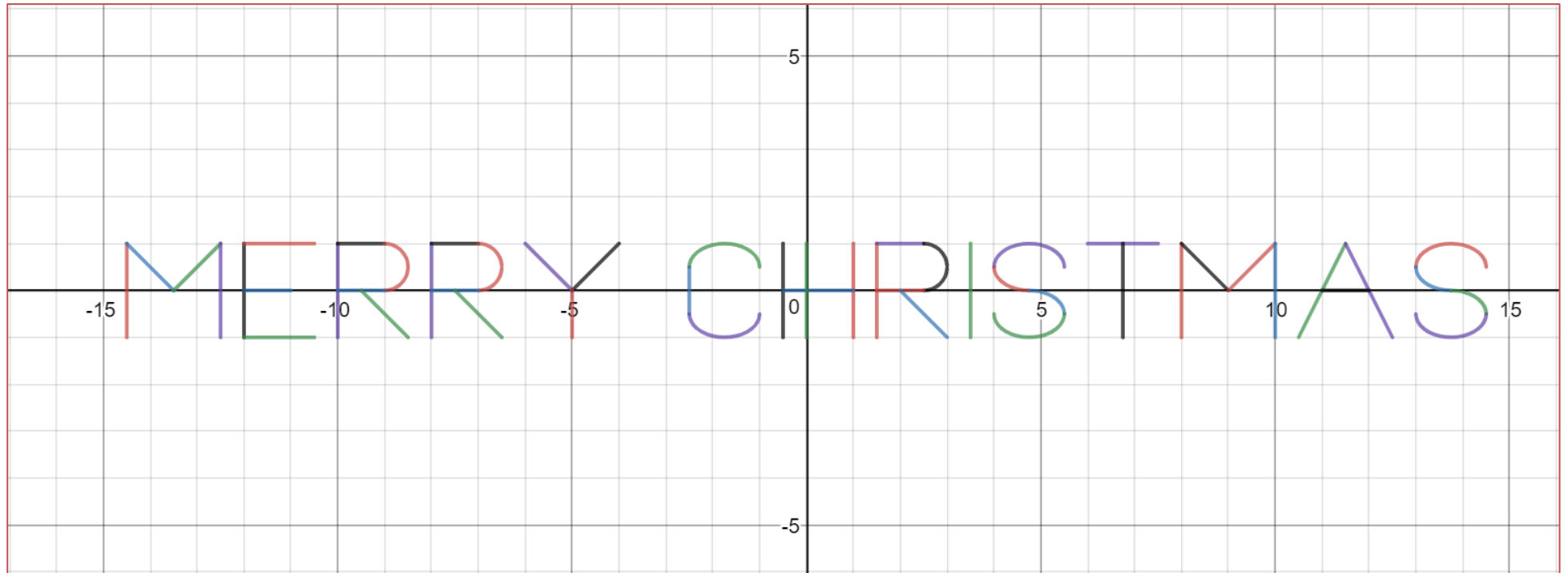
Giving the answers in the form of: $y = mx + c$, $y = c$, or $x = c$.

If you are familiar with the meaning of the terms domain and range, complete your answers with a full algebraic description for each line.



B: Straight Lines, Circles and Ellipses

Using your knowledge of straight lines, circles and ellipses, decode this message algebraically (including domain and range, if you can, where necessary).



Teaching Notes

A: Linear Graphs

This resource is suitable for KS5 practising domain and range or for KS4 or upper KS3 looking at linear graphs. Students could be given the whole word or the letters could be shared out amongst the class.

Answers:

Letter M:

1. $y = 3x + 54$ $\{-18 \leq x \leq -17\}$
 2. $y = -4x + 65$ $\{-17 \leq x \leq -16.5\}$
 3. $y = 4x + 67$ $\{-16.5 \leq x \leq -16\}$
 4. $y = -3x - 45$ $\{-16 \leq x \leq -15\}$

Letter R2:

13. $x = -9.5$ $\{0 \leq y \leq 3\}$
 14. $y = -\frac{1}{2}x - 1.75$ $\{-9.5 \leq x \leq -7.5\}$
 15. $y = \frac{1}{2}x + 5.75$ $\{-9.5 \leq x \leq -7.5\}$
 16. $y = -\frac{1}{2}x - 3.75$ $\{-9.5 \leq x \leq -7.5\}$

Letter H:

25. $x = -0.5$ $\{0 \leq y \leq 3\}$
 26. $x = 1.5$ $\{0 \leq y \leq 3\}$
 27. $y = 2$ $\{-0.5 \leq x \leq 1.5\}$

Letter T:

38. $y = 3$ $\{7.5 \leq x \leq 9.5\}$
 39. $x = 8.5$ $\{0 \leq y \leq 3\}$

Letter A:

44. $y = 3x - 40.5$ $\{13.5 \leq x \leq 14.5\}$
 45. $y = -3x + 46.5$ $\{14.5 \leq x \leq 15.5\}$
 46. $y = 1.5$ $\{14 \leq x \leq 15\}$

Letter E:

5. $x = -14.5$ $\{0 \leq y \leq 3\}$
 6. $y = 3$ $\{-14.5 \leq x \leq -12.5\}$
 7. $y = 1$ $\{-14.5 \leq x \leq -13\}$
 8. $y = 0$ $\{-14.5 \leq x \leq -12.5\}$

Letter Y:

17. $y = -\frac{3}{2}x - 7.5$ $\{-7 \leq y \leq -6\}$
 18. $y = \frac{3}{2}x + 10.5$ $\{-6 \leq x \leq -5\}$
 19. $y = -6$ $\{0 \leq x \leq 1.5\}$

Letter R:

28. $x = 2$ $\{0 \leq y \leq 3\}$
 29. $y = -\frac{1}{2}x + 4$ $\{2 \leq x \leq 4\}$
 30. $y = \frac{1}{2}x$ $\{2 \leq x \leq 4\}$
 31. $y = -\frac{1}{2}x + 2$ $\{2 \leq x \leq 4\}$

Letter M:

40. $y = 3x - 30$ $\{10 \leq x \leq 11\}$
 41. $y = -4x + 47$ $\{11 \leq x \leq 11.5\}$
 42. $y = 4x - 45$ $\{11.5 \leq x \leq 12\}$
 43. $y = -3x + 39$ $\{12 \leq x \leq 13\}$

Letter S:

47. $y = -x + 20$ $\{17 \leq x \leq 18\}$
 48. $y = x - 14$ $\{16 \leq x \leq 17\}$
 49. $y = -\frac{1}{2}x + 10$ $\{16 \leq x \leq 18\}$

Letter R1:

9. $x = -12$ $\{0 \leq y \leq 3\}$
 10. $y = -\frac{1}{2}x - 3$ $\{-12 \leq x \leq -10\}$
 11. $y = \frac{1}{2}x + 7$ $\{-12 \leq x \leq -10\}$
 12. $y = -\frac{1}{2}x - 5$ $\{-12 \leq x \leq -10\}$

Letter C:

20. $y = -x + 1$ $\{-2 \leq x \leq -1\}$
 21. $y = x + 5$ $\{-3 \leq x \leq -2\}$
 22. $x = -3$ $\{1 \leq y \leq 2\}$
 23. $y = -x - 2$ $\{-3 \leq x \leq -2\}$
 24. $y = x + 2$ $\{-2 \leq x \leq -1\}$

Letter I:

32. $x = 4.5$ $\{0 \leq y \leq 3\}$

Letter S:

33. $y = -x + 9$ $\{6 \leq x \leq 7\}$
 34. $y = x - 3$ $\{5 \leq x \leq 6\}$
 35. $y = -\frac{1}{2}x + 4.5$ $\{5 \leq x \leq 7\}$
 36. $y = x - 6$ $\{6 \leq x \leq 7\}$
 37. $y = -x + 6$ $\{5 \leq x \leq 6\}$

50. $y = x - 17$ $\{17 \leq x \leq 18\}$
 51. $y = -x + 17$ $\{16 \leq x \leq 17\}$

B: Lines, Circles and Ellipses

This resource is suitable for KS5 practising domain and range or for upper KS4. Students need a good knowledge of equations of circles and ellipses.

Students could be given the whole word or the letters could be shared out amongst the class.

Answers:**Letter M:**

1. $x = -14.5$ $\{-1 \leq y \leq 1\}$
2. $y = -x - 13.5$ $\{-14.5 \leq x \leq -13.5\}$
3. $y = x + 13.5$ $\{-13.5 \leq x \leq -12.5\}$
4. $x = -12.5$ $\{-1 \leq x \leq 1\}$

Letter R2:

14. $x = -8$ $\{-1 \leq y \leq 1\}$
15. $y = 1$ $\{-8 \leq x \leq -7\}$
16. $(x + 7)^2 + (y - 0.5)^2 = 0.25$ $\{-7 \leq x \leq -6.5\}$
17. $y = 0$ $\{-8 \leq x \leq -7\}$
18. $y = -x - 7.5$ $\{-7.5 \leq x \leq -6.5\}$

Letter H:

25. $x = -0.5$ $\{-1 \leq y \leq 1\}$
26. $x = 1$ $\{-1 \leq y \leq 1\}$
27. $y = 0$ $\{-0.5 \leq x \leq 1\}$

Letter T:

38. $y = 1$ $\{6 \leq x \leq 7.5\}$
39. $x = 6.75$ $\{-1 \leq y \leq 1\}$

Letter M:

40. $x = 8$ $\{-1 \leq y \leq 1\}$
41. $y = -x + 9$ $\{8 \leq x \leq 9\}$
42. $y = x - 9$ $\{9 \leq x \leq 10\}$
43. $x = 10$ $\{-1 \leq y \leq 1\}$

Letter E:

5. $x = -12$ $\{-1 \leq y \leq 1\}$
6. $y = 1$ $\{-12 \leq x \leq -10.5\}$
7. $y = 0$ $\{-12 \leq x \leq -11\}$
8. $y = -1$ $\{-12 \leq x \leq -10.5\}$

Letter Y:

19. $y = -x - 5$ $\{-6 \leq x \leq -5\}$
20. $y = x + 5$ $\{-5 \leq x \leq -4\}$
21. $x = -5$ $\{-1 \leq y \leq 0\}$

Letter R:

28. $x = 1.5$ $\{-1 \leq y \leq 1\}$
29. $y = 1$ $\{1.5 \leq x \leq 2.5\}$
30. $(x - 2.5)^2 + (y - 0.5)^2 = 0.25$ $\{2.5 \leq x \leq 3\}$
31. $y = 0$ $\{1.5 \leq x \leq 2.5\}$
32. $y = -x + 2$ $\{2 \leq y \leq 3\}$

Letter A:

44. $y = 2x - 22$ $\{10.5 \leq x \leq 11.5\}$
45. $y = -2x + 24$ $\{11.5 \leq x \leq 12.5\}$
46. $y = 0$ $\{11 \leq x \leq 12\}$

Letter R1:

9. $x = -10$ $\{-1 \leq y \leq 1\}$
10. $y = 1$ $\{-10 \leq x \leq -9\}$
11. $(x + 9)^2 + (y - 0.5)^2 = 0.25$ $\{-9 \leq x \leq -8.5\}$
12. $y = 0$ $\{-10 \leq x \leq -9\}$
13. $y = -x - 9.5$ $\{-9.5 \leq x \leq -8.5\}$

Letter C:

22. $\frac{16}{9}(x + 1.75)^2 + 4(y - 0.5)^2 = 1$ $\{0.5 \leq y \leq 1\}$
23. $x = -2.5$ $\{-0.5 \leq y \leq 0.5\}$
24. $\frac{16}{9}(x + 1.75)^2 + 4(y + 0.5)^2 = 1$ $\{-1 \leq x \leq -0.5\}$

Letter I:

33. $x = 3.5$ $\{-1 \leq y \leq 1\}$

Letter S:

34. $\frac{16}{9}(x - 4.75)^2 + 4(y - 0.5)^2 = 1$ $\{0.5 \leq y \leq 1\}$
35. $\frac{16}{9}(x - 4.75)^2 + 4(y - 0.5)^2 = 1$ $\{4 \leq x \leq 4.75\} \{0 \leq y \leq 0.5\}$
36. $\frac{16}{9}(x - 4.75)^2 + 4(y + 0.5)^2 = 1$ $\{4.75 \leq x \leq 5.5\} \{-0.5 \leq y \leq 0\}$
37. $\frac{16}{9}(x - 4.75)^2 + 4(y + 0.5)^2 = 1$ $\{-1 \leq y \leq -0.5\}$

Letter S:

47. $\frac{16}{9}(x - 13.75)^2 + 4(y - 0.5)^2 = 1$ $\{0.5 \leq y \leq 1\}$
48. $\frac{16}{9}(x - 13.75)^2 + 4(y - 0.5)^2 = 1$ $\{13 \leq x \leq 13.75\} \{0 \leq y \leq 0.5\}$
49. $\frac{16}{9}(x - 13.75)^2 + 4(y + 0.5)^2 = 1$ $\{13.75 \leq x \leq 14.5\} \{-0.5 \leq y \leq 0\}$
50. $\frac{16}{9}(x - 13.75)^2 + 4(y + 0.5)^2 = 1$ $\{-1 \leq y \leq -0.5\}$