# Equations of lines in three dimensions worksheet – Grade 12

Grade 12 · Mixed level · 20 questions · **Version X7070**

Name: _____ Date: _____ Score: ___ / 20

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1. Which is a direction vector of the line $x = -9 + 3t,\ y = 4 + 5t,\ z = -5 - 2t$?
   **A.** $[-3, 5, -2]$ **B.** $[3, 5, -2]$ **C.** $[3, 5, 2]$ **D.** $[-9, 4, -5]$

2. What is the point on $[x, y, z] = [-1, -1, -4] + t[4, -6, 3]$ where t = 3? Type it as (x, y, z).
   Answer: _____

3. Find the point on $[x, y, z] = [8, 9, 5] + t[2, 2, -6]$ where t = −1. Type it as (x, y, z).
   Answer: _____

4. Work out the point on $[x, y, z] = [1, -3, 2] + t[4, -6, 6]$ where t = 2. Type it as (x, y, z).
   Answer: _____

5. Find a direction vector for the line through A(9, −9, −9) and B(5, −5, −15), using $\overrightarrow{AB}$. Type it as [a, b, c].
   Answer: _____

6. Work out the point on $[x, y, z] = [-4, 5, 0] + t[-1, 2, 4]$ where t = −3. Type it as (x, y, z).
   Answer: _____

7. Which is a direction vector of the line $x = -4 - 2t,\ y = -6 - 3t,\ z = 4 + 3t$?
   **A.** $[-4, -6, 6]$ **B.** $[-4, -6, 4]$ **C.** $[-2, -3, -3]$ **D.** $[2, -3, 3]$

8. The line $[x, y, z] = [-6, 2, -8] + t[1, -6, 3]$ passes through a point with y = −10. Find that point. Type it as (x, y, z).
   Answer: _____

9. Does the point (18, 6, −8) lie on the line $[x, y, z] = [8, 1, -4] + t[5, 3, -2]$?
   **A.** No **B.** Yes, at t = 0 **C.** Yes, at t = 2

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10. The line $[x, y, z] = [0, -9, 8] + t[-6, 6, -5]$ passes through a point with z = −17. Find that point. Type it as (x, y, z).

    Answer: _____

11. Which are symmetric equations of the line $[x, y, z] = [-6, 7, 3] + t[-3, 6, -4]$?

    **A.** $\frac{x-6}{-3} = \frac{y+7}{6} = \frac{z+3}{-4}$ **B.** $\frac{x+6}{-3} = \frac{y-7}{6} = \frac{z-3}{-4}$

    **C.** $\frac{x+3}{-6} = \frac{y-6}{7} = \frac{z+4}{3}$ **D.** $\frac{x+6}{-3} = \frac{y-7}{-6} = \frac{z-3}{-4}$

12. The line $[x, y, z] = [-5, -3, -2] + t[-6, -2, -4]$ passes through a point with x = 19. Find that point. Type it as (x, y, z).

    Answer: _____

13. The line $[x, y, z] = [9, 2, 2] + t[-5, -1, 3]$ passes through a point with y = 3. Find that point. Type it as (x, y, z).

    Answer: _____

14. Does the point (−8, 2, 20) lie on the line $[x, y, z] = [-4, 0, 6] + t[-2, 1, 6]$?

    **A.** No **B.** Yes, at t = 2 **C.** Yes, at t = 0

15. Find the acute angle between the lines $[x, y, z] = [7, -8, 3] + s[-3, 1, 4]$ and $[x, y, z] = [5, -8, 8] + t[5, 3, -5]$, to the nearest tenth of a degree.

    Answer: _____ °

16. Find the point where the lines $[x, y, z] = [-17, 13, 1] + s[5, -6, -2]$ and $[x, y, z] = [-5, 1, 10] + t[-1, 2, 5]$ intersect. Type it as (x, y, z).

    Answer: _____

17. How are the lines $[x, y, z] = [5, 8, 8] + s[-3, 5, 1]$ and $[x, y, z] = [6, 8, 8] + t[-9, 15, 3]$ related?

    **A.** skew **B.** parallel and distinct **C.** the same line **D.** intersecting at one point

18. Work out the acute angle between the lines $[x, y, z] = [7, -9, 0] + s[-2, 4, 1]$ and $[x, y, z] = [-7, -9, 0] + t[-1, 0, -6]$, to the nearest tenth of a degree.

    Answer: _____ °

19. What is the point where the lines $[x, y, z] = [10, 11, -19] + s[-4, -5, 5]$ and $[x, y, z] = [2, 4, 6] + t[2, 4, 5]$ intersect? Type it as (x, y, z).

    Answer: _____

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20. What is the acute angle between the lines $[x, y, z] = [-9, 5, -3] + s[-5, -5, 5]$ and $[x, y, z] = [0, -3, -8] + t[-6, 3, 3]$, to the nearest tenth of a degree?

    Answer: _____ °

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# Answer key · Version X7070

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1. **B (**$[3, 5, -2]$**)**
2. **(11, -19, 5)**
3. **(6, 7, 11)**
4. **(9, -15, 14)**
5. **[-4, 4, -6]**
6. **(-1, -1, -12)**
7. **A (**$[-4, -6, 6]$**)**
8. **(-4, -10, -2)**
9. **A (No)**
10. **(-30, 21, -17)**
11. **B (**$\frac{x+6}{-3} = \frac{y-7}{6} = \frac{z-3}{-4}$**)**
12. **(19, 5, 14)**
13. **(14, 3, -1)**
14. **A (No)**
15. **35.2**
16. **(-2, -5, -5)**
17. **B (parallel and distinct)**
18. **81.7**
19. **(-2, -4, -4)**
20. **61.9**

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