Determinants

Standard difficulty · 20 questions · 40 marks · Time: 42 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The value of $\begin{vmatrix} -6 & 1 \\ 7 & 7 \end{vmatrix}$ is:

(a) 49 **(b)** −35 **(c)** −55 **(d)** −49

2. The value of $\begin{vmatrix} 5 & 4 & 3 \\ 5 & 3 & -1 \\ -4 & 5 & -3 \end{vmatrix}$ is:

(a) 172 **(b)** 164 **(c)** −167 **(d)** 167

3. The area of the triangle with vertices (1, −6), (4, 1), (4, −1) is:

(a) 3 square units **(b)** 4 square units
(c) 3/2 square units **(d)** 6 square units

4. If $\begin{vmatrix} x & -1 \\ 6 & x \end{vmatrix} = \begin{vmatrix} 4 & 5 \\ 2 & 13 \end{vmatrix}$, then x is:

(a) ±7 **(b)** 6 only **(c)** ±36 **(d)** ±6

5. A determinant is defined only for:

(a) diagonal matrices only **(b)** row matrices
(c) any matrix **(d)** square matrices

6. A is a square matrix of order 3 with $|A| = -5$. Then $|A^{-1}|$ equals:

(a) 25 **(b)** −5 **(c)** 1/5 **(d)** −1/5

7. The cofactor of a_{23} in $\begin{vmatrix} 0 & 2 & 1 \\ -4 & 1 & 4 \\ 3 & 2 & -4 \end{vmatrix}$ is:

(a) 6 **(b)** −5 **(c)** −6 **(d)** 24

8. Assertion (A): The points (1, 4), (3, 5) and (−5, 1) are collinear.
Reason (R): Three points are collinear when the triangle they form has zero area.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Find adj A and A^{-1} for $A = \begin{bmatrix} 5 & 3 \\ 0 & 1 \end{bmatrix}$.

10. Find the inverse of $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 1 & -1 \\ 0 & 0 & -2 \end{bmatrix}$.

11. Solve by the matrix method: $-5x - 3y = -23$, $5x + 4y = 29$.

12. Find k if the area of the triangle with vertices (k, 0), (2, 0) and (0, −5) is 5 square units.

13. For $A = \begin{bmatrix} -1 & 6 & 2 \\ 2 & 3 & 2 \\ 1 & 3 & 5 \end{bmatrix}$, find the minors and cofactors of the elements of the first row, and hence |A|.

14. For $A = \begin{bmatrix} -6 & 7 \\ -2 & -1 \end{bmatrix}$, verify that A (adj A) = |A| I.

15. Use determinants to find the equation of the line through (1, 6) and (−5, 1).

16. Find x if the matrix $\begin{bmatrix} -18 & 6 \\ x & 3 \end{bmatrix}$ is singular.

Section C — Word problems — 4 × 4 = 16 marks

17. Solve by the matrix method: $-2x + y + 4z = -14$, $2x - 2y = -2$, $3x - y + 4z = -31$.

18. Arjun buys 5 kg sugar, 2 kg potatoes, 2 kg onions for Rs 190; Priya buys 1 kg sugar, 5 kg potatoes, 1 kg onions for Rs 105; Kabir buys 5 kg sugar, 3 kg potatoes, 3 kg onions for Rs 235. Use matrices to find the price of 1 kg of each.

19. Find A^{-1} for $A = \begin{bmatrix} 3 & 3 & -1 \\ 2 & -1 & 1 \\ 2 & -1 & 2 \end{bmatrix}$, and verify that $A\,A^{-1} = I$.

20. For $A = \begin{bmatrix} 4 & 0 \\ -3 & 2 \end{bmatrix}$, show that $A^2 - 6A + 8I = O$, and use it to find A^{-1}.

Want another sheet on this chapter? In the Ambiful Worksheets app every sheet is new, with its answer key, and your child never gets the same question twice.
Scan the code to get the free app, or open **worksheets.ambiful.com/get**

Answer key

Determinants · AW-12M-DET-2026-V1 · For parents — fold back or tear off before handing the sheet to your child.

Q	Answer	Working
1	**(d) −49**	$(-6) \times 7 - 1 \times 7$
2	**(d) 167**	expand along the first row: $5 \times (-4) + 4 \times (19) + 3 \times (37)$
3	**(a) 3 square units**	$\frac{1}{2}\lvert x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\rvert = \frac{1}{2} \times 6$
4	**(d) ±6**	$x^2 - (-6) = 42$, so $x^2 = 36$
5	**(d) square matrices**	—
6	**(d) −1/5**	$\lvert A^{-1}\rvert = 1/\lvert A\rvert$
7	**(a) 6**	$(-1)^5 \times \begin{vmatrix} 0 & 2 \\ 3 & 2 \end{vmatrix} = (-1)^5 \times (-6)$
8	**(a) Both A and R are true, and R is the correct explanation of A.**	A is true: the area determinant is 0. R is true and explains A.
9	**adj A = $\begin{bmatrix} 1 & -3 \\ 0 & 5 \end{bmatrix}$; $A^{-1} = \begin{bmatrix} 1/5 & -3/5 \\ 0 & 1 \end{bmatrix}$**	$\lvert A\rvert = 5$; $A^{-1} = (1/\lvert A\rvert)$ adj A
10	**$A^{-1} = \begin{bmatrix} -1 & 3 & -2 \\ 1 & -2 & 3/2 \\ 0 & 0 & -1/2 \end{bmatrix}$**	$\lvert A\rvert = 2$; adj A = $\begin{bmatrix} -2 & 6 & -4 \\ 2 & -4 & 3 \\ 0 & 0 & -1 \end{bmatrix}$
11	**x = 1, y = 6**	$\lvert A\rvert = -5$; $X = A^{-1}B$
12	**k = 0 or k = 4**	$\frac{1}{2}\lvert -5(2 - k)\rvert = 5 \Rightarrow \lvert 2 - k\rvert = 2$
13	**$M_{11} = 9$, $M_{12} = 8$, $M_{13} = 3$; $A_{11} = 9$, $A_{12} = -8$, $A_{13} = 3$; $\lvert A\rvert = -51$**	$\lvert A\rvert = (-1)(9) + 6(-8) + 2(3)$
14	**adj A = $\begin{bmatrix} -1 & -7 \\ 2 & -6 \end{bmatrix}$; A (adj A) = $\begin{bmatrix} 20 & 0 \\ 0 & 20 \end{bmatrix}$ = 20I**	$\lvert A\rvert = 20$
15	**5x − 6y = −31**	$\begin{vmatrix} x & y & 1 \\ 1 & 6 & 1 \\ -5 & 1 & 1 \end{vmatrix} = 0$
16	**x = −9**	$-54 - 6x = 0$
17	**x = −5, y = −4, z = −5**	$\lvert A\rvert = 24$; adj A = $\begin{bmatrix} -8 & -8 & 8 \\ -8 & -20 & 8 \\ 4 & 1 & 2 \end{bmatrix}$; $X = (1/\lvert A\rvert)(\text{adj } A)B$
18	**sugar: Rs 20 per kg; potatoes: Rs 10 per kg; onions: Rs 35 per kg**	$\lvert A\rvert = 20$; $X = A^{-1}B$
19	**$\lvert A\rvert = -9$; $A^{-1} = \begin{bmatrix} 1/9 & 5/9 & -2/9 \\ 2/9 & -8/9 & 5/9 \\ 0 & -1 & 1 \end{bmatrix}$**	adj A = $\begin{bmatrix} -1 & -5 & 2 \\ -2 & 8 & -5 \\ 0 & 9 & -9 \end{bmatrix}$
20	**$A^2 = \begin{bmatrix} 16 & 0 \\ -18 & 4 \end{bmatrix}$; $A^{-1} = \begin{bmatrix} 1/4 & 0 \\ 3/8 & 1/2 \end{bmatrix}$**	multiply $A^2 - 6A + 8I = O$ by A^{-1}: $A^{-1} = (1/8)(6I - A)$