

AL HUDA SCIENCE ACADEMY

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Most Important Long Questions of Mathematics

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1. Simplify the following: $[5 \cdot (25)^{(n+1)} - 25 \cdot (5)^{(2n)}] / [5 \cdot (5)^{(2n+3)} - (25)^{(n+1)}]$
2. Simplify the following: $[(16)^{(x+1)} + 20(4)^{(2x)}] / [2^x(x-3) \times 8^x(x+2)]$
3. Simplify the following: $[5^{(n+3)} - 6 \cdot 5^{(n+1)}] / [9 \times 5^n - 2^n \times 5^n]$
4. If $x = 3 + \sqrt{8}$, then find the value of: $x^4 + 1/x^4$
5. Find the rational numbers p and q such that: $(8 - 3\sqrt{2}) / (4 + 3\sqrt{2}) = p + q\sqrt{2}$
6. Simplify the following: $[54 \times \sqrt[3]{(27)^{(2x)}}] / [9^x(x+1) + 216(3^x(2x-1))]$
7. Simplify the following: $[(25)^{(3/2)} \times (243)^{(3/5)}] / [(16)^{(5/4)} \times (8)^{(4/3)}]$
8. Simplify the following: $\sqrt{\{(216)^{(2/3)} \times (25)^{(1/2)}\} / (0.04)^{(-3/2)}}$
9. Simplify the following: $(a^{(1/3)} + b^{(2/3)}) \times (a^{(2/3)} - a^{(1/3)}b^{(2/3)} + b^{(4/3)})$
10. Find the value of x: $\log x = -1.5726$
11. In a class of 55 students, 34 like to play cricket and 30 like to play hockey. Also, each student likes to play at least one of the two games. How many students like to play both games?
12. In a group of 500 employees, 250 can speak Urdu, 150 can speak English, 50 can speak Punjabi, 40 can speak Urdu and English, 30 can speak both English and Punjabi, and 10 can speak Urdu and Punjabi. How many can speak all three languages?
13. In a training session, 17 participants have laptops, 11 have tablets, 9 have laptops and tablets, 6 have laptops and books, and 4 have both tablets and books. Eight participants have all three items. The total number of participants with laptops, tablets, or books is 35. How many participants have books?
14. There are 95 secondary school students in a sports club. 58 students join the swimming club, and 50 join the tug-of-war club. How many students participated in both games?
15. Verify De Morgan's Laws for the following sets: $U = \{1, 2, 3, \dots, 20\}$, $A = \{2, 4, 6, \dots, 20\}$, and $B = \{1, 3, 5, \dots, 19\}$.
16. Factorize the following expression: $x^4 - 30x^2y^2 + 9y^4$
17. Factorize the following expression: $x^4 - 7x^2y^2 + y^4$
18. Factorize the following expression: $(x + 2)(x - 7)(x - 4)(x - 1) + 17$
19. Factorize the following expression: $(x + 1)(x + 2)(x + 3)(x + 6) - 3x^2$
20. Factorize: $a^4 + 64$
21. Find HCF by factorization method: $a^3 + 2a^2 - 3a$, $2a^3 + 5a^2 - 3a$

22. Find HCF of the following expressions by using the division method: $27x^3 + 9x^2 - 3x - 10$, $3x - 2$
23. Find HCF of the following expressions by using the division method: $x^3 - 9x^2 + 23x - 15$, $x^2 - 4x + 3$
24. Find LCM of the following expressions by using the prime factorization method: $x^4 - 16$, $x^3 - 4x$
25. The HCF of two polynomials is $y - 7$ and their LCM is $y^3 - 10y^2 + 11y + 70$. If one of the polynomials is $y^2 - 5y - 14$, find the other.
26. The LCM and HCF of two polynomials $p(x)$ and $q(x)$ are $36x^3(x + a)(x^3 - a^3)$ and $x^2(x - a)$ respectively. If $p(x) = 4x^2(x^2 - a^2)$, find $q(x)$.
27. The HCF and LCM of two polynomials are $(x + a)$ and $12x^2(x + a)(x^2 - a^2)$ respectively. Find the product of the two polynomials.
28. The LCM of $x^2y + xy^2$ and $x^2 + xy$ is $xy(x + y)$. Find the HCF.
29. Factorize the following: $x^4 + 64$
30. Factorize the following: $(x^2 + 6x + 3)(x^2 + 6x - 9) + 36$
31. Find LCM and HCF by prime factorization method: $4x^3 + 12x^2$, $8x^2 + 16x$
32. Find LCM and HCF by prime factorization method: $x^3 + 3x^2 - 4x$, $x^2 - x - 6$
33. Indicate the solution region of the following linear inequalities by shading: $2x - 3y \leq 6$, $2x - 3y \leq 12$
34. Indicate the solution region of the following linear inequalities by shading: $3x + 7y \geq 21$, $x - y \leq 2$
35. Indicate the solution region of the following linear inequalities by shading: $3x + 7y \geq 21$, $y \leq 4$
36. Indicate the solution region of the following linear inequalities by shading: $5x + 7y \leq 35$, $x - 2y \leq 2$
37. If the central angle of a sector is 60° and the radius of the circle is 12 cm, find the area of the sector and the percentage of the total area of the circle it represents.
38. If θ lies in the first quadrant, find the remaining trigonometric ratios of θ : $\tan \theta = 1/2$
39. Prove the following trigonometric identity: $(\sin \theta + \cos \theta)^2 = 1 + 2 \sin \theta \cos \theta$
40. Prove the following trigonometric identity: $\sin \theta / \operatorname{cosec} \theta + \cos \theta / \sec \theta = 1$
41. Prove the following trigonometric identity: $(1 - \sin \theta) / \cos \theta = \cos \theta / (1 + \sin \theta)$
42. Prove the following trigonometric identity: $(\sec \theta - \tan \theta)^2 = (1 - \sin \theta) / (1 + \sin \theta)$
43. Prove the following trigonometric identity: $(\tan \theta + \cot \theta)^2 = \sec^2 \theta \cdot \operatorname{cosec}^2 \theta$
44. Show that: $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$
45. Find the unknown side and angles of the following triangle: $a = \sqrt{3}$ cm, $c = \sqrt{13}$ cm.

46. Solve the following triangle when $m\angle B = 90^\circ$, $m\angle C = 60^\circ$, $c = 3\sqrt{3}$ cm.
47. Solve the following triangle when $m\angle B = 90^\circ$, $m\angle C = 45^\circ$, $a = 8$ cm.
48. Solve the following triangle when $m\angle B = 90^\circ$, $m\angle A = 60^\circ$, $c = 4$ cm.
49. If a ladder is placed along a wall such that the foot of the ladder is 2 m away from the wall and the length of the ladder is 8 m, find the height of the wall.
50. The diagonal of a rectangular field ABCD is $(x + 9)$ m and the sides are $(x + 7)$ m and x m. Find the value of x .
51. Prove the following identity: $\sin \theta / (1 - \cos \theta) = (1 + \cos \theta) / \sin \theta$
52. Prove the following identity: $\sin \theta (\operatorname{cosec} \theta - \sin \theta) = 1 / \sec^2 \theta$
53. Show that the points A(0, 2), B($\sqrt{3}$, 1), and C(0, -2) are vertices of a right triangle.
54. Show that the points A(3, 1), B(-2, -3), and C(2, 2) are vertices of an isosceles triangle.
55. Show that the points A(5, 2), B(-2, 3), C(-3, -4), and D(4, -5) are vertices of a parallelogram.
56. Find k so that the line joining A(7, 3), B(k , -6) and the line joining C(-4, 5), D(-6, 4) are perpendicular.
57. Convert the following equation into slope-intercept form, two-intercept form, and normal form:
 $4x + 7y - 2 = 0$
58. Write down an equation of the straight line passing through (5, 1) and parallel to a line passing through the points (0, 1) and (7, 15).
59. A man who is 1.8 m tall casts a shadow of 0.76 m in length. If at the same time a telephone pole casts a 3 m shadow, find the height of the pole.
60. Find the unknown A_1 in the given figure: A_1 has slant height 15 cm; a similar figure with slant height 12 cm has $A_2 = 96 \text{ cm}^2$.
61. Given that the area of $\triangle ABC = 36 \text{ cm}^2$ and $mAB = 6$ cm, $mBD = 4$ cm, find the area of $\triangle ADE$.
62. Given that the area of $\triangle ABC = 36 \text{ cm}^2$ and $mAB = 6$ cm, $mBD = 4$ cm, find the area of trapezium BCED.
63. The mass of a sack of rice is 50 kg and its height is 4 m. Find the mass of a similar sack of rice with a height of 6 m.
64. The ratio of the areas of two similar labels on two similar jars of coffee is 144:169. Find the ratio of their capacities.
65. Plot the graph of the following function: $y = 4^x$
66. Plot the graph of the following function: $y = 5^{-x}$
67. Plot the graph of the following function: $y = x^{1/2}$

68. Plot the graph of the following function: $y = 3x^{1/3}$
69. Plot the graph of the following function: $y = 2x^{-2}$
70. Given the measurements of $\triangle DEF$: $m\angle D = 4.8^\circ$, $m\angle E = 4^\circ$, and $m\angle F = 45^\circ$. Draw the altitudes of $\triangle DEF$ and find the orthocentre.
71. Draw the angle bisector of a triangle FGH if: $m\angle F = 5.2^\circ$, $m\angle G = 4.1^\circ$, and $m\angle H = 120^\circ$.
72. The marks obtained by students in English are given. Find the Median of their marks:

Marks	Frequency
15–19	9
20–24	18
25–29	35
30–34	17
35–39	5

73. Given below is a frequency distribution. Find the Mode of the distribution:

Class Interval	Frequency
5–9	1
10–14	8
15–19	18
20–24	11
25–29	2

74. Ten boys work on a petrol pump. They get weekly wages as follows: 4250, 4350, 4400, 4250, 4350, 4410, 4500, 4300, 4500, 4390. Find the Arithmetic Mean by short formula, the Median, and the Mode of their wages.
75. The monthly attendance of 10 students for lunch is: 21, 15, 16, 18, 14, 17, 15, 12, 13, 11. Find the Median and Mode. Also find the Mean if $D = A - 20$.
76. The following are heights (in inches) of 40 students in Grade 8. Find the Mode:

Heights	Frequency
48–50	10
50–52	9
52–54	5
54–56	7
56–58	6
58–60	3
Total students	40

77. The adjoining distribution shows the maximum load (in kg) supported by certain ropes. Find the Mean load using the short method:

Load (kg)	Frequency
93–97	5
98–102	12
103–107	6
108–112	2

113–117	2
118–122	8

78. The frequency of defective products in 750 samples is shown below. Find the Relative Frequency for the given table:

Defectives	Frequency
0	12
1	14
2	8
3	9
4	10
5	6
6	4
7	5
8	5

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