- Set language and set notation, rational expressions and conditional identities, Laws of indices.

Important formulae and theorems of Algebra

1. $a^2 - b^2 = (a - b)(a + b)$
2. $(a + b)^2 = a^2 + 2ab + b^2$
3. $a^2 + b^2 = (a - b)^2 + 2ab$
4. $(a - b)^2 = a^2 - 2ab + b^2$
5. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
6. $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(a + b)(b + c)(c + a)$
7. $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - ac - bc) = 12(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$
   if $(a+b+c) = 0$, then $a^3 + b^3 + c^3 = 3abc$
8. $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$;
   or, $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
9. $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
10. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
11. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
12. $x^2 + x(a + b) + ab = (x + a)(x + b)$
13. Rules of indices
    - $a^{-n} = 1/a^n$
    - $(a^m)(a^n) = a^{m+n}$
    - $(ab)^m = a^m b^m$
    - $(a^m)^n = a^{mn}$
    - $a^m/a^n = am^{-n}$
    - $a^0 = 1$
14. Remainder Theorem – Let $f(x)$ be a polynomial of a degree greater than or equal to one and α be any real number, if $f(x)$ is divided by $(x-\alpha)$ then the remainder is $f(\alpha)$.
15. Factor theorem – Let $f(x)$ be a polynomial of degree greater than or equal to one and α be any real number such that $f(\alpha) = 0$, then $(x-\alpha)$ is a factor of $f(x)$.

$$\alpha,\beta = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Tips and tricks for solving algebra problems

- A lot of questions in algebra can be solved by putting some values of variables in the question, and it can help you in solving the question in no time. But this method needs to be applied very carefully. Your first approach to solve the problem should always be through basic method especially when you are practising at home.
- Even if you solve a problem correctly by putting values in variables, you must be aware of the basic method to solve the question. So after solving questions in quizzes you must look for basic/alternative methods in the solutions provided.
- Variety of questions in algebra is more as compared to other topics in mathematics. In order to solve a question easily in exam you should be familiar with different types of questions that are asked in CDS exam. If you would have solved the similar questions before, it will be quite easy for you to attempt them in the exam. So we sincerely advise you to solve previous year question papers of at least 5 years before appearing in the exam.
- You must remember all the important formulae in algebra. There is just no way around it.

To give you guys some idea about the type of questions asked in the CDS exam, here are some questions asked in the previous exams of CDS.

1. If $x = y^{1/a}$, $y = z^{1/b}$, and $z = x^{1/c}$ where $x\neq1$, $y\neq1$, $z\neq1$, then what is the value of abc?

a. -1

b. 1

c. 0

d. 3

Solution:

$x = y^{1/a}$, $y = z^{1/b}$, and $z = x^{1/c}$

$\log log\ z = \frac{1}{c} \log log\ x$

Calculating the values of a, b and c

$a = \frac{\log log\ y}{\log log\ x}$

$b = \frac{\log log\ z}{\log log\ y}$

$c = \frac{\log log\ x}{\log log\ z}$

2. If the roots of the equation $px^2 + x + r = 0$ are reciprocal to each other, then which one of the following is correct?

a. P = 2r
b. P = r
c. 2p = r
d. P = 4r

Solution:

Let the roots be x and 1/x.

Use the property of quadratic equations {x+y = -b/a , xy = c/a};
x*1/x = r/p
1 = r/p
r = p
Thus option (b) is correct.

3. What is the value of α (α≠0) for which $x^2 - 5x + α$ and $x^2 - 7x + 2α$ have a common factor?

a. 6
b. 4
c. 3
d. 2

Solution:

Let (x - a) be the factor of both quadratic equation.

$a = \frac{7\pm\sqrt{49-8\alpha}}{2}$ (from (ii))

Now, $\frac{5\pm\sqrt{25-4\alpha}}{2} = \frac{7\pm\sqrt{49-8\alpha}}{2}$

$\Rightarrow 5\pm\sqrt{25-4\alpha} = 7\pm\sqrt{49-8\alpha}$

$\Rightarrow \sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 7-5$

$\Rightarrow \sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 2$

Squaring both sides we get

$\Rightarrow 25-4\alpha+49-8\alpha+2\sqrt{(25-4\alpha)(49-8\alpha)} = 4$

$\Rightarrow (6\alpha-35)^2 = (25-4\alpha)(49-8\alpha)$

$\Rightarrow 1225-396\alpha+32\alpha^2 = 36\alpha^2+1225-420\alpha$

$\Rightarrow 4\alpha^2-24\alpha = 0$

$\Rightarrow 4\alpha(\alpha-6) = 0$

$\Rightarrow \alpha = 0$, or $\alpha = 6$

Thus option (a) is the correct answer.

Lastly practice of previous year papers and solving mock test would benefit the candidate in scoring good marks in the exam.

Note: Students who are going to appear for the CDS-I 2019 exam are requested to fill out the form below:

Click here to fill

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