ACE OF PACE

ENGINEERING | Grade X moving to XI | DATE: 12/04/2026

Section – A: Only One Option Correct

1. (C)

By factor theorem, if $g(x)$ is a factor of $f(x) \Rightarrow f(-4)=0$

i.e. $2(-4)^3+k(-4)^2-7(-4)-12=0$

$\Rightarrow 16k-112=0 \qquad \Rightarrow k=7$

2. (B)

$$x^8-y^8=(x^4-y^4)(x^4+y^4)$$
$$=\{(x^2-y^2)(x^2+y^2)\}(x^4+y^4)$$
$$=(x-y)(x+y)(x^2+y^2)(x^4+y^4)$$
$$=(x-y)(x+y)(x^2+y^2)\left\{(x^2)^2+(y^2)^2+2x^2y^2-2x^2y^2\right\}$$
$$=(x-y)(x+y)(x^2+y^2)\left\{(x^2+y^2)^2-(\sqrt{2}xy)^2\right\}$$
$$=(x-y)(x+y)(x^2+y^2)(x^2+y^2-\sqrt{2}xy)(x^2+y^2+\sqrt{2}xy)$$

3. (A)

$$p(x)=x^3+x^2+x+1=(x+1)(x^2+1)$$
$$p(x)\times q(x)=\pm \text{L.C.M}\times \text{H.C.F}$$
$$q(x)=\pm\frac{\text{L.C.M}\times\text{H.C.F}}{p(x)}$$
$$=\pm\frac{2(x^4-1)\times(x+1)(x^2+1)}{(x+1)(x^2+1)}$$
$$=\pm 2(x^4-1)=\pm(2x^4-2)$$

4. (D)

$$x^4+\frac{1}{x^4}=119$$
$$\Rightarrow\left(x^2+\frac{1}{x^2}\right)^2-2=119$$
$$\left(x^2+\frac{1}{x^2}\right)^2=121$$
$$\Rightarrow\left(x^2+\frac{1}{x^2}\right)=11$$
$$\left(x-\frac{1}{x}\right)^2+2=11 \quad \left(x-\frac{1}{x}\right)^2=9$$

$\Rightarrow\ x-\frac{1}{x}=3$

Now, $x^3-\frac{1}{x^3}=\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x}\cdot x+\frac{1}{x^2}\right)$

$=3(11+1)=36$

5. (B)

Remainder $=f\left(\frac{\sqrt{3}}{2}\right)$

$=2\left(\frac{\sqrt{3}}{2}\right)^2+\left(2\sqrt{2}-\sqrt{3}\right)\frac{\sqrt{3}}{2}-\sqrt{6}$

$=\frac{3}{2}+\sqrt{6}-\frac{3}{2}-\sqrt{6}$

$=0$

6. (B)

7. (B)

8. (B)

Here, the maximum frequency is 17 and the corresponding class is 12–16. So 12–16 is the modal class.
Now, $\ell=12, h=4, f=17, f_1=9$ and $f_2=12$.

$\therefore$ Mode $=\ell+\frac{f-f_1}{2f-f_1-f_2}\times h$

$=12+\frac{17-9}{34-9-12}\times 4$

$=12+\frac{8}{13}\times 4=12+\frac{32}{13}$

9. (A)

10. (A)

Applying Dividendo, $\frac{x^2}{x-2}=\frac{4x^2}{5x-6}$

Dividing by x^2 which gives a solution $x = 0$.

$\Rightarrow\ \frac{1}{x-2}=\frac{4}{5x-6}$

$5x-6=4x-8\Rightarrow x=-2$

Therefore, the values of x are 0 and –2.

11. (D)

Given, $A=\frac{4ab}{a+b}$

$\Rightarrow\ \frac{A}{2a}=\frac{2b}{a+b}$ .....(1)

and $\frac{A}{2b}=\frac{2a}{a+b}$ .....(2)

By componendo and dividendo

$$\Rightarrow \frac{A+2a}{A-2a}=\frac{2b+a+b}{2b-a-b} \text{ and } \frac{A+2b}{A-2b}=\frac{2a+a+b}{2a-a-b}$$

$$\Rightarrow \frac{A+2a}{A-2a}=\frac{a+3b}{b-a} \text{ and } \frac{A+2b}{A-2b}=\frac{3a+b}{a-b}.$$

Adding both, we get

$$\frac{A+2a}{A-2a}+\frac{A+2a}{A-2a}=\frac{a+3b}{b-a}+\frac{3a+b}{a-b}$$

$$=\frac{(3a+b)}{a-b}-\frac{(a+3b)}{a-b}=\frac{3a+b-a-3b}{a-b}$$

$$=\frac{2(a-b)}{(a-b)}=2.$$

12. (B)

Let the length of unequal side be x cm. Then perimeter = 30 cm

$\Rightarrow \quad x+12+12=30$

$\Rightarrow \quad x+2=30$

$\Rightarrow \quad x=6\text{ cm}$

We have, $2s=30\text{ cm}$

$\therefore \quad s=15\text{ cm}$

Hence, area $=\sqrt{s(s-a)(s-b)(s-c)}$

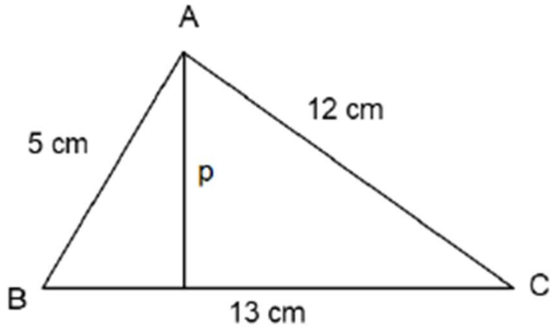
$=\sqrt{15\times(15-12)\times(15-12)\times(15-6)}$

$=\sqrt{15\times3\times3\times9}=9\sqrt{15}\text{ cm}^2$

13. (C)

Here, a = 5, b = 12 and c = 13.

$\therefore\ s=\frac{1}{2}(a+b+c)=\frac{1}{2}(5+12+13)=15.$



Let ‘A’ be the area of the given triangle. Then,

$A=\sqrt{s(s-a)(s-b)(s-c)}=\sqrt{15\times(15-5)\times(15-12)\times(15-13)}$

$\Rightarrow\ A=\sqrt{15\times10\times3\times2}=30\text{ cm}^2 \qquad .....(i)$

Let p be the length of the perpendicular from vertex A on the side BC. Then,

$A=\frac{1}{2}\times13\times p \qquad .....(ii)$

From (i) and (ii), we get

$\frac{1}{2}\times13\times p=30\Rightarrow=\frac{60}{13}\text{cm}.$

14. (D)

$$\frac{x+1}{x-1}+\frac{x-2}{x+2}=3 \Rightarrow \frac{x+1}{x-1}+\frac{x-2}{x+2}-3=0$$

$\Rightarrow \dfrac{(x+1)(x+2)+(x-1)(x-2)-3(x-1)(x+2)}{(x-1)(x+2)}=0$

$\Rightarrow (x+1)(x+2)+(x-1)(x-2)-3(x-1)(x+2)=0$

$\Rightarrow x^2+3x+2+x^2-3x+2-3(x^2+x-2)=0$

$\Rightarrow -x^2-3x+10=0 \Rightarrow -(x^2+3x-10)=0$

$\Rightarrow x^2+3x-10=0$

$\Rightarrow (x+5)(x-2)=0 \Rightarrow x=-5$ or $x=2$.

$\therefore$ $x=-5, 2$ are the solutions of the given equation.

15. (C)

For the given equation

$a=k-12, b=2(k-12)\ c=2$

$D=b^2-4ac$

$=4(k-12)^2-4(k-12)(2)$

$=(4)(k-12)(k-14)$

A quadratic equation has equal roots if $D=0$

$\Rightarrow 4(k-12)(k-14)=0$

$\Rightarrow k=12$ or $k=14$

$\Rightarrow k=14$ only.

16. (A)

Product of the roots $=\dfrac{2m-1}{m}=-1$

$\Rightarrow 2m-1=-m$

$\Rightarrow 3m-1 \Rightarrow m=\dfrac{1}{3}$

17. (D)

Let α, β be the roots

$\therefore \alpha+\beta=-\dfrac{2}{q}$

$\alpha\beta=\dfrac{3q}{q}=3$

Since $\alpha+\beta=\alpha\beta$

$\therefore -\dfrac{2}{q}=3 \Rightarrow q=-\dfrac{2}{3}$

18. (D)

Given –4 is a root of the equation $x^2+px-4=0$

$\therefore (-4)^2+p(-4)-4=0$

$\Rightarrow 4p=12$

$\Rightarrow p=3$

Given the equation $x^2+px+k=0$ has equal roots.

$\therefore \ D=0$

$p^2-4k=0$

$9-4k=0$

$k=\frac{9}{4}$

$\therefore \ p=3$ and $k=\frac{9}{4}$

19. (D)

In the given A.P., the first term, $a = 1$

Common Difference, $d = 2$

So the general term is

$a+(n-1)d$

$=1+(n-1)2$

$=1+2n-2$

$=2n-1$

As the last term is 101, so the number of terms is given by $2n-1=101$ or $2n=102$

or $2n=102$

or $n=\frac{102}{2}=51$

As 51 – 25 = 26.

So the sum of 25 terms from the end

$=S_{51}-S_{26}$

$=\frac{51}{2}\left[2\times1+(51-1)\times2\right]-\frac{26}{2}\left[2\times1+(26-1)\times2\right]$

$=\frac{51}{2}[2+100]-13[2+50]=\frac{51}{2}\times102-13\times52$

$=51\times51-13\times52$

$=2601-676=1925$

20. (A)

First term of the A.P., $a = 5$

Let the common difference = d

So, the general term is $a+(n-1)d=5+(n-1)d$

Therefore, 11th term is $5+(11-1)d=5+10d$

But 11th term is given to be 55, therefore

$5+10d=55$

or $10d=55-5=50$

Thus $d=\frac{50}{10}=5$

Further, let N be the number of terms.

As 10th term from the end = 11th term from the beginning

So, $a+(N-10)d=a+(11-1)d$

or, $(N-10)5=10\times5$

or, $5N-50=50$

or, $5N=100$

or, $N=20$

Finally, the last term is

$a+(N-1)d=5+(20-1)d$

$= 5 + 19 \times 5$
$= 100$

Section – B: Challenge Yourself

21. (A)

22. (D)

Let r be the radius of each circle and a is the length of each side of the equilateral triangle.

Area of equilateral triangle $= \frac{\sqrt{3}}{4}a^2$

$\frac{17300 \times 4}{\sqrt{3}} = a^2$

$a^2 = \frac{17300 \times 4}{1.73} = 40000$

$a = 200$ cm

Length of each equilateral triangle = 200 cm

Radius of each circle $= \frac{a}{2} = \frac{200}{2} = 100$ cm

Area of sector APQ in circle

$= \frac{\pi r^2 \theta}{360} = \frac{3.14 \times (100)^2 \times 60}{360} = \frac{15700}{3}\text{cm}^2$

Total area of 3 sectors $= 3 \times \frac{15700}{3} = 15700\text{ cm}^2$

$\therefore$ area of the shaded region \

= area of the equilateral triangle – area of 3 equal sector

= 17300 – 15700 = 1600 cm^2.

23. (C)

Calculation of Median

Marks	No. of students (Frequency)	Cumulative frequency
0–10	5	5
10–30	15	20
30–60	30	50
60–80	8	58
80–90	2	60
		$N = \sum f_i = 60$

Here N = 60 $\quad\quad \therefore \frac{N}{2} = 30$

The cumulative frequency just greater tan $\frac{N}{2} = 30$ is 50 and the corresponding class is 30–60.

Hence 30–60 is the median class.

$\therefore \ell = 30, f = 30, F = 20, h = 30$

Now, median $= \ell + \frac{\frac{N}{2} - F}{f} \times h$

$= 30 + \frac{30-20}{30} \times 30 = 40$

24. (D)
Let the unknown polynomial be $p(x)$ and let $q(x)$ be quotient and $r(x) = ax + b$, the remainder
$\Rightarrow\ p(x) = (x-1)(x-2)q(x) + ax + b$ .....(i)
Using given condition
$p(x) = (x-1)q_1(x) + 2$ where $p(1) = 2$.
and $p(x) = (x-2)q_2(x) + 1$ where $p(2) = 1$.
By substituting $x = 1$ and $x = 2$, successively, in (i), we obtain the two equations
$p(1) = a + b = 2$ .....(ii)
$p(2) = 2a + b = 1$ .....(iii)
Solving (ii) and (iii), we get $a = -1$, $b = 3$
Hence, the remainder is $-x + 3$.

25. (D)
Let x be the required term. So $x^3 = x$
or $x^3 - x = 0$
or $x(x^2 - 1) = 0$
or $x(x-1)(x+1) = 0$
Either $x = 0$, 1 or –1.
Now, the first term of the A.P., $a = 51$
Common difference, $d = -4$
Therefore, general term
$= a + (n-1)d$
$= 51 + (n-1)(-4)$
$= 51 - 4n + 4 = 55 - 4n$
If 55 – 4n = 0, then 4n = 55 or $n = \frac{55}{4}$, which is not a natural number.
If 55 – 4n = 1, then 4n = 54 or $n = \frac{55}{4}$, which is not a natural number.
If 55 – 4n = –1, then 4n = 56 or $n = \frac{56}{4} = 14$
Thus 14th term of the A.P. is the cube of itself.

Section – C: Logical Reasoning

26. (B)
Each alphabet is replaced by next alphabet.

27. (D)
By observation

28. (A)
$(2+6) \times 4 = 32$
$(3+7) \times 5 = 50$
So answer is
$(8+12) \times 10 = 200$

Direction for Question No. 29 & 30: Read the following carefully and answer the questions given below:

Ravi and Kunal are good in Hockey and Volleyball. Sachin and Ravi are good in Hockey and Baseball. Gaurav and Kunal are good in Cricket and Volleyball. Sachin, Gaurav and Micheal are good in Football and Baseball.

29. (C)
30. (C)

Sol.

NAME/SPORTS	HOCKEY	VOLLEBALL	BASEBALL	CRICKET	FOOTBALL
RAVI	GOOD	GOOD	GOOD		
KUNAL	GOOD	GOOD		GOOD	
SACHIN	GOOD		GOOD		GOOD
GAURAV		GOOD	GOOD	GOOD	GOOD
MICHAL			GOOD		GOOD

NOW BY OBSERVATION