ACE OF PACE
Grade X moving to XI

ENGINEERING **SOLUTIONS** **DATE: 21/09/2025**

SECTION – A

1. (C)
Given, $\frac{a}{b} = \frac{a-c}{b-d}$

$\Rightarrow \frac{a}{b} = \frac{a-c}{b-d} = \frac{a-(a-c)}{b-(b-d)} = \frac{c}{d}$ $\therefore \frac{a}{b} = \frac{c}{d} = \left(\frac{2a^2+3c^2}{2b^2+3d^2}\right)^{\frac{1}{2}}$

2. (C)
$T_5 = a + 4d = 7$
$S_9 = \frac{9}{2}(2a+8d) = 9(a+4d)$
$= 9 \times 7 = 63$

3. (B)
$b^2 - 4ac > 0 \Rightarrow 36 - 4k > 0 \Rightarrow k < 9$

4. (A)
The remaining kangaroos weigh (100 – 25 – 60)% = 15% of the total weight.
However, this cannot be made up of the weights of more than one kangaroos since the information in the question tells us that the lightest two weighs 25% of the total.
Hence there are 2 + 1 + 3 = 6 kangaroos in the mob.

5. (B)
2(3x) = (x + 1) + (4x + 2)
x = 3

6. (D)
By Remainder theorem, $P(1) = 5 \Rightarrow 2 - a + b = 5 \Rightarrow b - a = 3$ .....(i)
$P(-1) = 6 + a + b = 19 \Rightarrow b + a = 13$ .....(ii)
b = 8 and a = 5 $\therefore P(2) = 10$

7. (A)
$$\frac{4}{9^{1/3} - 3^{1/3} + 1} = \frac{(3+1)}{3^{2/3} - 3^{1/3} + 1} = \frac{(3^{1/3}+1)(3^{2/3} - 3^{1/3} + 1)}{(3^{2/3} - 3^{1/3} + 1)} = 3^{1/3} + 1$$

8. (B)

$\alpha+\beta=5 \qquad \alpha\beta=3$

$(\alpha+\beta)^2=\alpha^2+\beta^2+2\alpha\beta$

$\therefore\ \alpha^2+\beta^2=25-6=19$

$\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}=\frac{19}{3}$

9. (D)

$a^{9/6\cdot 4/3}\cdot a^{9/3\cdot 4/6}=a^4$

10. (A)

$\alpha^2=4\alpha-13 \qquad \beta^2=4\beta-13$

Now, $\alpha^4-4\alpha^3+13\alpha^2+2$

$=\alpha^2\left(\alpha^2-4\alpha+13\right)+2=2$

$\frac{1}{4}[\beta^3-4\beta^2+13\beta+1]$ using $\beta^2=4\beta-13$

$\frac{1}{4}[\beta(\beta^2-4\beta+13)+1]=\frac{1}{4}$

Equation is $4x^2-9x+2=0$

11. (A)

$2x^3-5x^2+x+2=ax^3-(2a+b)x^2+(2b-1)x+2$

$\therefore$ a = 2

2a + b = 5 and 2b – 1 = 1

$\therefore$ $b=1$

12. (A)

$\alpha+\beta=9,\ \alpha\beta=3$

$\alpha^2+\beta^2=b,\ \alpha^2\beta^2=-c$

$81-2\times 3=b,\ \Rightarrow\ 9=-c$

b = 75, c = – 9

13. (C)

3x + 2y + 5z = 15 ….. (1)

4x + 3y + 7z = 25 ….. (2)

2 × equation (1) – equation (2)

2x + y + 3z = 5

14. (C)

199 = 1 + (n – 1)2 $\Rightarrow 2(n-1)=198$

$\Rightarrow n-1=99$

n = 100

$S=\frac{100}{2}\left[1+199\right]=10000$

15. (C)

Let the given prime numbers be a, b, c, d.

Then, abc = 385 and bcd = 1001.

$\therefore\ \frac{abc}{bcd}=\frac{385}{1001}\Rightarrow\frac{a}{d}=\frac{5}{13}$ So, a = 5, d = 13.

16. (C)

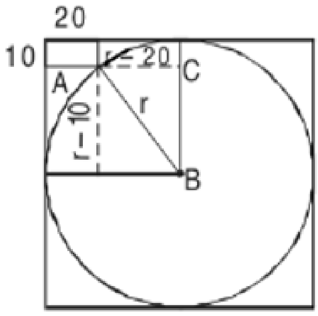
$T_1 = 2+5 = 7$

$T_1 + T_2 = 2\times 2^2 + 5\times 2 = 18$

$\therefore \quad T_2 = 11$

$\therefore \quad d = 11-7 = 4$

17. (C)



Let the radius be r. Thus by Pythagoras theorem for ΔABC we have $(r-10)^2 + (r-20)^2 = r^2$

i.e. $r^2 - 60r + 500 = 0$. Thus r = 10 or 50.

It would be 10, if the corner of the rectangle had been lying on the inner circumference. But as per the given diagram, the radius of the circle should be 50 cm.

18. (D)

$\alpha + \beta = k \qquad \alpha\beta = 36$

$36 : 1\times 36,\ 2\times 18,\ 3\times 12,\ 4\times 9,\ 6\times 6$

Similarly with both –ve signs

$\therefore$ Total 10 values of k.

19. (D)

$\frac{a}{4} - \frac{b}{2} + c = 0$, compare it with $ax^2 + bx + c \Rightarrow x = -\frac{1}{2}$

20. (B)

Other root will be conjugate of $-2+\sqrt{3}$, which is $-2-\sqrt{3}$.

SECTION – B

21. (C)

$a = \frac{x}{x^2+y^2},\ b = \frac{y}{x^2+y^2}$

$a + b = \frac{x+y}{x^2+y^2}$

$x + y = (a+b)(x^2+y^2) \qquad .....(1)$

$a^2 + b^2 = \frac{1}{x^2+y^2} \qquad .....(2)$

From equation (1) and (2)

$x + y = \frac{a+b}{a^2+b^2}$.

22. (C)

$(\alpha^{n-1}+\beta^{n-1})(\alpha+\beta)$

$=\alpha^n+\beta^n+\alpha\beta(\alpha^{n-2}+\beta^{n-2})$

$a_{n-1}\left(-\frac{b}{a}\right)=a_n+\frac{c}{a}a_{n-2}$

$aa_n+ba_{n-1}+ca_{n-2}=0$

$a_n-3a_{n-1}+a_{n-2}=0$

$\frac{a_n+a_{n-2}}{a_{n-1}}=3$

23. (B)

f(x) = (x – 1) g(x) + 5 ; f(x) = (x + 1) h(x) + 3

f(x) = (x + 2) ϕ(x) + 2 ; $f(x)=(x^3+2x^2-x-2)p(x)+ax^2+bx+c$ .....(1)

f(1) = 0 + a + b + c ; f(–1) = 0 + a – b + c

f(–2) = 4a – 2b + c $\Rightarrow$ a + b + c = 5, a – b + c = 3, 4a – 2b + c = 2

$\Rightarrow$ a = 0, b = 1, c = 4 from equation (1) remainder is x + 4

24. (B)

One root is 1 and $\alpha\beta=\frac{c-a}{a-b}\Rightarrow\beta=\frac{c-a}{a-b}=1$

$\therefore\quad 2a=b+c$

25. (A)

$a^2-b^2=(a-b)(a+b)$

$3^2-2^2=(3-2)(2+3)=2+3$

$5^2-4^2=(5-4)(5+4)=4+5$

$\vdots$

$1+2+3+4+...+19=\frac{19\times 20}{2}=190$

SECTION – C

26. (C)

By observation.

27. (C)

□

✕ + ○ = □ ⇒ ✕ = □ – ○

2□ = 7✕

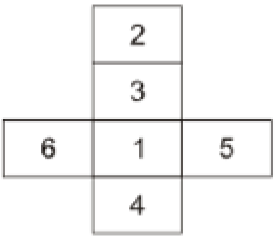
∴ 6✕ = 2□ – ✕ = 2□ – (□ – ○) = □ + ○

28. (D)

By observation.

29. (D)
89 is a large number to be the sum of the digits of a ten digit number.
In fact, the largest possible digital sum is 10×9 or 90.
Since 89 is only 1 less than 90, the number in question must be composed of nine 9's and one 8.
In order that the number be divisible by 2, the last digit must be 8.

30. (D)
Net pattern will be :



i.e. 6 is opposite to 5.