CTS ACADEMY
COMPETE TO SUCCEED

CTS - SAT 2022

CTS ACADEMY SCHOLARSHIP – CUM – ADMISSION TEST

MOCK TEST SOLUTIONS

Class: 10th Moving to 11th

Sol.1.

$$\text{Refractive index} = \frac{\text{Velocity of light in air}}{\text{Velocity of light in Medium(liquid)}}$$

$$= \frac{3\times10^8}{2.5\times10^8}$$

$$= 1.2$$

So, option (c) is correct.

Sol.2.

As person cannot see beyond a distance of 20 cm from his eyes, so it can be corrected by Concave lens of focal length equal to the least distance of distinct vision i.e. 20 cm as given.

So, option (d) is correct.

Sol.3.

As given R = 22 cm, u = -14 cm

$\therefore$ f = 11 cm, u = -14 cm

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\frac{1}{v}=\frac{1}{11}+\frac{1}{14}=\frac{14+11}{154}$$

$$v=\frac{154}{25}=6.16\,\text{cm}$$

Hence image is formed at 6.2 cm on back side of mirror.

So, option (b) is correct.

Sol.4.

If d is distance between object and image then

u + v = d

According to lens formula

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{-u}$$

$$\frac{1}{f}=\frac{1}{d-u}+\frac{1}{u}$$

$$f=\frac{ud-u^2}{d}$$

$u^2 - ud + df = 0$

For real u we must have

$d^2 - 4df \geq 0$

$d - 4f \geq 0$

$d \geq 4f$

So, option (b) is correct.

Sol.5.

Difference between apparent and real depth of a pond is due to refraction of light.

So, option (d) is correct.

Sol.6.

As we know that $m = \frac{v}{u} = -4$

$\therefore$ v = -4u

and given that |u| + v = 1.5 $\Rightarrow$ u = -0.3m, v = 1.2m

$\therefore \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$\frac{1}{1.2} + \frac{1}{0.3} = \frac{1}{f}$

$f = \frac{1.2}{5} = 0.24\,cm$

So, option (a) is correct.

Sol.7.

Bending of object placed in liquid suffers change in path of light from one medium to another due to Refraction of light.

So, option (b) is correct.

Sol.8.

A light goes from denser to rarer medium it goes away from Normal ray while from rarer to denser it bends towards Normal.

So, option (b) correctly represents it.

So, option (b) is correct.

Sol.9.

This decomposition takes place when electric current is passed through water.

Option (c) is correct.

Sol.10.

K^+: Potassium Ion

SO_3^{2-} : Sulphite Ion

Option (a) is correct.

Sol.11.

$$Al + Cr_2O_3(s) \rightarrow Cr(s) + Al_2O_3(s)$$

Addition of oxygen
or
Oxidation
or
Reducing Agent

Option (b) is correct.

Sol.12.

Option (d) is correct.

Sol.13.

X is $CaOCl_2$ (Calcium Oxychloride)

Option (a) is correct.

Sol.14.

Option (b) is correct.

Sol.15.

A salt that is derived from reaction of strong acid with a strong base forms a solution of pH closer to 7.

e.g. $HCl + NaOH \rightarrow NaCl + H_2O$

Option (b) is correct.

Sol.16.

$2KI\ (aq) + Pb(NO_3)_2\ (aq) \rightarrow 2KNO_3\ (aq) + PbI_2\ (s)$

Bright Yellow ppt.

Option (a) is correct.

Sol.17.

Option (b) is correct.

Sol.18.

Option (b) is correct.

Sol.19.

Option (d) is correct.

Sol.20.

Option (c) is correct.

Sol.21.

If BT : CT = 7 : 3 then BC : CT = 10 : 3

As AB || ST; $\Delta ABC \sim \Delta STC$

$$\frac{AB}{ST} = \frac{BC}{CT}$$

$$\frac{8}{ST} = \frac{10}{3}$$

ST = 2.4 cm

So, option (a) is correct.

Sol.22.

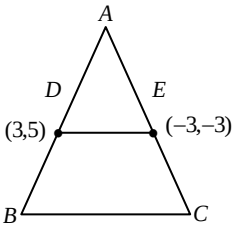
By Mid-Point theorem

$$DE = \frac{1}{2}BC$$

$$BC = 2DE$$

$$= 2 \times 10 = 20$$

So, option (b) is correct.



Sol.23.

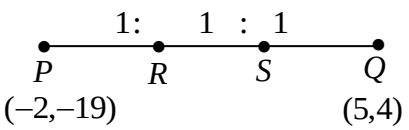
Coordinates of R are

$$\left(\frac{5-4}{3}, \frac{4-38}{3}\right) = \left(\frac{1}{3}, -\frac{34}{3}\right)$$

Coordinates of S are

$$\left(\frac{10-2}{3}, \frac{8-19}{3}\right) = \left(\frac{8}{3}, -\frac{11}{3}\right)$$

So, option (c) is correct.



Sol.24.

$\sqrt{3}\tan\theta = 3\sin\theta$

$\sqrt{3}\sin\theta = 3\sin\theta\cos\theta$

$\sin\theta(\sqrt{3} - 3\cos\theta) = 0$

Either sinθ = 0 or $\cos\theta = \frac{1}{\sqrt{3}}$

$As \sin^2\theta - \cos^2\theta = \sin^2\theta - (1 - \sin^2\theta) = 2\sin^2\theta - 1$

$= 1 - \cos^2\theta - \cos^2\theta = 1 - 2\cos^2\theta$

$\therefore \sin^2\theta - \cos^2\theta = -1 or \frac{1}{3}$

So, option (a) is correct.

Sol.25.

cos (α + β) = 0

α + β = 90°

∴ α = 90° - β

Hence sin (α - β) = sin (90° - 2β) = cos2β.

So, option (b) is correct.

Sol.26.

As 3x + 4y = K and 9x + 12y = 6 has more than one solution

Hence $\frac{3}{9} = \frac{4}{12} = \frac{K}{6}$

∴ K = 2

So, option (c) is correct.

Sol.27.

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

$= \left(-\frac{31}{6}\right)^2 - 2\left(-\frac{29}{6}\right)$

$= \frac{961}{36} + \frac{58}{6} = \frac{1309}{36}$

So, option (d) is correct.

Sol.28.

$\alpha + \beta = -\frac{b}{a}$ and $\alpha\beta = \frac{c}{a}$

$\therefore \frac{1}{\alpha} + \frac{1}{\beta} = -\frac{b}{c}$ and $\frac{1}{\alpha\beta} = \frac{a}{c}$

∴ Equation is $cx^2 + bx + a$

So, option (a) is correct.

Sol.29.

LCM of (40, 60) is 120

So Bell will ring simultaneously after 120 minutes i.e. 2 hours. Hence at 12:00 PM they will ring simultaneously.

So, option (a) is correct.

Sol.30.

Let length be x and breadth be y
As given (x + 2) (y + 2) = xy + 76 and (x + 3) (y – 3) = xy – 21
x + y = 36 and -x + y = -4
So, option (d) is correct.

Sol.31.

Length of Rectangle = 21 cm + 42 cm
= 63 cm
Area of shaded region = Area of Rectangle – Area of sector

$$= 63 \times 42 - \frac{\pi}{4} \times (42)^2$$

$$= 2646 - 1386 = 1260\,cm^2$$

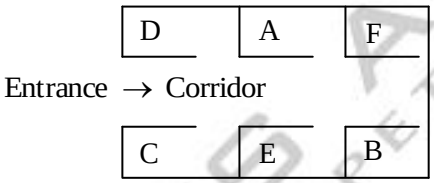
So, option (d) is correct.

Sol.32.

Sum can be either 2, 3, 5, 7 or 11
∴ Number of possible outcomes are 15
∴ Probability = $\frac{15}{36} = \frac{5}{12}$
So, option (a) is correct.

Directions for Solutions 33 and 34:

After analyzing the information, we can draw the following diagram:



Sol.33.

From diagram, we can easily conclude that E's office face A's office.
So, option (a) is correct.

Sol.34.

Since, we can see clearly from diagram that A sits in centre of left side of Corridor (as one enters the office block) and if A faces the Corridor then D's office is right to the A's office.
So, option (b) is correct.

Sol.35.

Clearly, in the given series, each term is one more than the product of digits of the preceding term. Thus (7 × 8) + 1 = 57, (5 × 7) + 1 = 36, (3 × 6) + 1 = 19. So, 11 is wrong term and it must be replaced by (1 × 9) + 1 = 10.
So, option (d) is correct.

Sol.36.

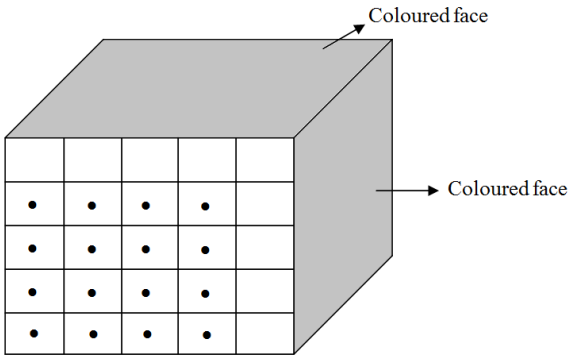
Clearly option (a). In other pairs, two words are opposite to each other.
So, option (a) is correct.

Sol.37.

A	B	C	D		F	G	H	I
↓ +13	↓ +14	↓ +15	↓ +16		↓ +13	↓ +14	↓ +15	↓ +16
N	P	R	T		S	U	W	Y

So, option (c) is correct.

Sol.38.



As shown in figure, let the upper face and RHS face of cube be coloured. Then clearly rows of smaller cubes which are indicated by dots, have none of their sides coloured. Since there are 16 such rows and each row consists of 5 smaller cubes, so there are $16 \times 5 = 80$ cubes which are not coloured at all.

So, option (b) is correct.

Sol.39.

Putting A = 1, B = 2, C = 3, D = 4, E = 5, …, X = 24, Y = 25 and Z = 26, we have

$(A + F) \times 2 + 1 = (1 + 6) \times 2 + 1 = 15$

$(I + E) \times 2 + 1 = (9 + 5) \times 2 + 1 = 29$

$(T + X) \times 2 + 1 = (20 + 24) \times 2 + 1 = 89$

$(D + G) \times 2 + 1 = (4 + 7) \times 2 + 1 = 23$

So, option (c) is correct.

Sol.40.

From figure (ii) and (iii), we conclude that the number 1, 4, 5 and 6 are adjacent to the number 3. Clearly number 2 is opposite to 3 and vice-versa.

So, option (b) is correct.