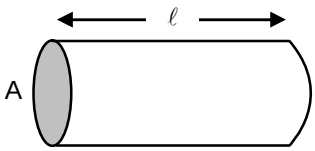
PAPER & SOLUTION

1. [A]

Sol.



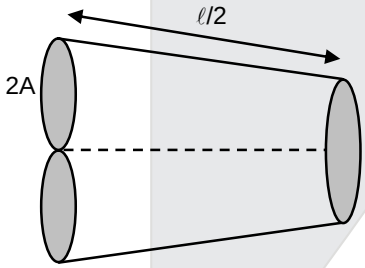
Length = ℓ

Area = A

$R = \rho\frac{1}{A}$

$4\Omega = \rho\frac{1}{A}$

given



$R' = \rho\frac{\ell}{2(2A)}$

$R' = \frac{\rho\ell}{4A} = \frac{4}{4} = 1\Omega$

5. [A]

Sol. Let Celsius and Fahrenheit Scale be x

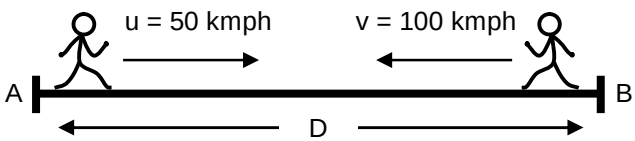
According to formula,

$F = \frac{9C}{5} + 32$ $\quad \begin{bmatrix} F - \text{Fahrenheit Scale} \\ C - \text{Celsius Scale} \end{bmatrix}$

$x = \frac{9x}{5} + 32$

$x = -40^{\circ}$

6.



Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$\Rightarrow \frac{D+D}{t_1+t_2}$

$\Rightarrow \frac{2D}{\frac{D}{u}+\frac{D}{v}}$

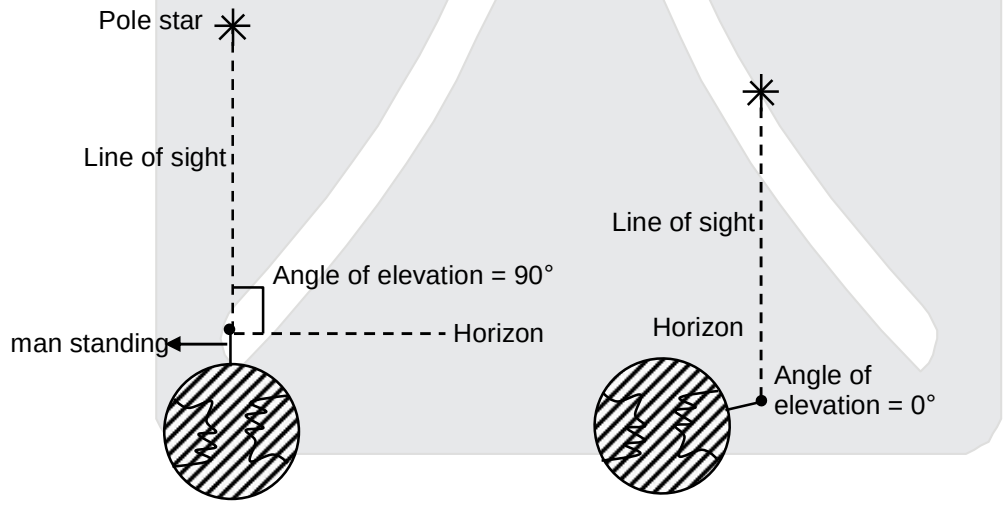
$\Rightarrow \frac{2D}{d+\left(\frac{u+v}{uv}\right)}$

$\Rightarrow \frac{2uv}{u+v}$

$\Rightarrow \frac{2\times 50\times 100}{50+100}$

$\Rightarrow$ 75 kmph

7. At Pole (latitude = 90°) At Equator (latitude = 0°)



with the two pictures it is clear that latitude angle is equivalent to angle of elevation.

8. Series resistance (equivalent) > Any single resistance $R_s > R_1$

Parallel resistance (equivalent) < Any single resistance $R_P < R_1$.

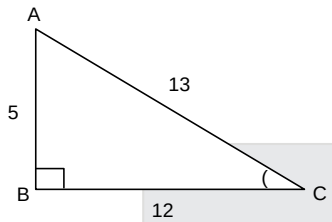
81. If cosA = $\frac{9}{41}$, = $\frac{B}{H}$

Let B = 9x, H = 41x , Then P = 40x

Then (1) cotA = $\frac{B}{P} = \frac{9x}{40x} = \frac{9}{40}$

(2) $\text{cosec}A = \frac{H}{P} = \frac{41x}{40x} = \frac{41}{40}$

82. $\sin C = \frac{AB}{AC} = \frac{5}{13}$



83. $(\sec\theta + \tan\theta)(1 - \sin\theta)$

$$\left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)(1 - \sin\theta)$$

$$= \frac{(1+\sin\theta)(1-\sin\theta)}{\cos\theta} = \frac{1-\sin^2\theta}{\cos\theta} = \frac{\cos^2\theta}{\cos\theta}$$

$= \cos\theta$

84. If $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$

Then $\left(\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}\right) = \left(\frac{\frac{1}{\sin^2\theta} - \frac{1}{\cos^2\theta}}{\frac{1}{\sin^2\theta} + \frac{1}{\cos^2\theta}}\right)$

$$= \left(\frac{\cos^2\theta - \sin^2\theta}{\cos^2\theta + \sin^2\theta}\right) = (\cos^2\theta - \sin^2\theta)$$

Put $\theta = 30°$

$\Rightarrow \quad \cos^2 30° - \sin^2 30°$

$$\Rightarrow \quad \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 \Rightarrow \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$$

Ans is not given in options.

85. $D \geq 0$ (for real roots)

$(b^2 - ac) \geq 0$

$(2)^2 - 4(3)(k) \geq 0$

$4 - 12k \geq 0 \quad \Rightarrow \quad 4 \geq 12k$

$12k \leq 4$

$k \leq \frac{1}{3}$ Option (A)

86. let, her age is = x yr

ATQ

$\Rightarrow$ $(x - 5)(x + 8) = 30$

$\Rightarrow$ $x^2 + 3x - 40 = 30$

$\Rightarrow$ $x^2 + 3x - 70 = 0$

$\Rightarrow$ $(x + 10)(x - 7) = 0$

$\Rightarrow$ $x = 7$ year $\Rightarrow$ $x = -10$ is not possible Option (C)

87. If b = 3h meter

Then area $= \frac{1}{2} \times b \times h$

$\Rightarrow$ $96 = \frac{1}{2} \times 3h \times h$

$\Rightarrow$ $h^2 = 64$

$\Rightarrow$ $h = 8$ m

Then, base = 3(8) = 24 m

88. In a leap year = 52 weak + 2 days

fav. outcomes = {SM, SS}

Total outcomes = {SM, MT, TW, WTh, ThF, FS, SS}

P(53 Sunday) $= \frac{2}{7}$

89. Total face cards = 12

P(face card) $= \frac{\text{fav. outcomes}}{\text{Total outcomes}} = \frac{12}{52} = \frac{3}{13}$

90. $p = 2(\ell + b) = 206$

$\Rightarrow$ $\boxed{(\ell + b) = 103}$ ..... (1)

also, $\Rightarrow$ $\boxed{\ell = b + 23}$ ..... (2)

from (1) & (2)

$\Rightarrow$ $2b + 23 = 103$

$\Rightarrow$ $2b = 80$

$\boxed{b = 40}$

Then

$\Rightarrow \ell = 40 + 23$

$\boxed{\ell = 63}$

Then, Area = $\ell \times b$

$= 63 \times 40 = 2520\ m^2$

Option (D)

91. T.S.A. = $6a^2 = 864\ cm^2$

(cube) $a^2 = 144\ cm^2$

$a = 12$ cm

Volume of cube (a^3) = $12 \times 12 \times 12 = 1728\ cm^3$

Option (C)

92. Length of longest pole = $\sqrt{\ell^2 + b^2 + h^2}$

$= \sqrt{12^2 + 9^2 + 8^2}$

$= \sqrt{144 + 81 + 64}$

$= \sqrt{289} = 17$ m

Option (B)

93. Let point P(a, 0),

ATQ

PA = PB

$\Rightarrow (PA)^2 = (PB)^2$

$\Rightarrow (a-7)^2 + (6-0)^2 = (a+3)^2 + (4-0)^2$

$\Rightarrow a^2 - 14a + 49 + 36 = a^2 + 9 + 6a + 16$

$\Rightarrow 60 = 20a$

$\Rightarrow a = 3$

Hence, point is P(3, 0)

Options - C

94. A (0, 6), B (–5, 3), C (3, 1)

$AB = \sqrt{(0+5)^2 + (6-3)^2} = \sqrt{25+9} = \sqrt{34}$

$BC = \sqrt{(3+5)^2 + (3-1)^2} = \sqrt{64+4} = \sqrt{68}$

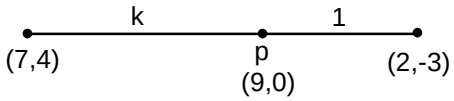
$AC = \sqrt{(0-3)^2 + (1-6)^2} = \sqrt{9+25} = \sqrt{34}$

Since, AB = AC $\Rightarrow$ Isosceles Triangle

Also, $(AB)^2 + (AC)^2 = (BC)^2 \Rightarrow$ Right angled.

$\Rightarrow$ **Option A & C both.**

95. Let Ratio is K : 1



$$\Rightarrow \quad P\left(\frac{2K+7}{K+1}, \frac{-3K+4}{K+1}\right) \equiv (9, 0)$$

By equating y - coordinate

$$\left(\frac{-3K+4}{K+1}\right) = 0$$

$$K = \frac{4}{3} \quad \text{or} \quad \frac{2}{1.5}$$

96. If $x \in A \cup B$

$\Rightarrow$ option B is correct

$\Rightarrow$ $\{x \mid x \in A \text{ or } x \in B\}$

97. By property

$A \cap \phi = \phi$

98. Let CP of one thing = x Rs

SP of that thing = $\left(\frac{3x}{2}\right)$ Rs

Profit = SP – CP = $\left(\frac{3x}{2}\right) - (x) = \left(\frac{x}{2}\right)$ Rs.

$$\% P = \left(\frac{p}{Cp} \times 100\right) = \left(\frac{\left(\frac{x}{2}\right)}{x} \times 100\right)$$

= 50 %

Option = D

99. Let CP for 'A' is = Rs. x

$\Rightarrow$ SP of 'A' = CP of B = $\left(\frac{120}{100}x\right)$

$\Rightarrow$ SP of B = CP is C = $\frac{125}{100}\left(\frac{120}{100}x\right)$

ATQ

$$\left(\frac{\cancel{125}}{\cancel{100}}\right)\left(\frac{\cancel{120}}{\cancel{100}}\,x\right) = 225$$

$$\Rightarrow \frac{\cancel{5}}{4} \times \frac{6}{\cancel{5}}\, x\ 225$$

$$\Rightarrow \frac{3x}{2} = 225$$

$\Rightarrow 3x = 450$ $\qquad$ $\boxed{x = 150\ Rs}$

Option (D)

100. h = 14 cm

C.S.A = 264 cm^2

$\Rightarrow 2\pi r \times 14 = 264$

$$\Rightarrow 2 \times \frac{22}{7} \times r \times 14 = 264$$

$\Rightarrow 88\ r = 264$

r = 3 cm

Volume of cylinder

$= \pi\, r^2\, h$

$$= \frac{22}{7} \times 3 \times 3 \times 14$$

$= 22 \times 18$

$= 396\ cm^2$