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TOGETHER IN SUCCESS

NTPC 2026

ARKA DEY

Table Of Content:

- Handout 2

1. The larger of two supplementary angles is 28 degree more than smaller one. The smaller angle (in degree) is

a) 76 b) 79 c) 80 d) 84

$Sum = 180$, Complimentary $90°$

$$L + S = 180$$
$$L - S = 28$$

$$S = \frac{180 - 28}{2} = \frac{152}{2} = 76$$

$$x + y = 180$$
$$x - y = 28$$

$$x = \frac{180 + 28}{2}, \quad y = \frac{180 - 28}{2}$$

2. If 260 is the mean proportion between x and 338, what is the value of x?
$$\underline{\qquad\qquad}\quad (b) \qquad \underline{\qquad\qquad}$$

a) 200 b) 198 c) 199 d) 201

$$b = \sqrt{ac}$$

$$b^2 = ac$$

$$(260)^2 = x \times 338$$

$$x = \frac{260 \times 260}{338}$$

$$\frac{\overset{2}{676} \times 100}{338} = 200$$

3. The average of first 14 whole number is

a) 6.5 b) 7.5 c) 3.7 d) 5.5

$$0, 1, 2, 3, --- , 13$$

$$\left(1 + --- +13\right) \rightarrow Sum = \frac{n(n+1)}{2}$$

$$= \frac{13 \times 14}{2}$$

$$14 \rightarrow avg = \frac{13 \times 14}{2 \times 14} = 6.5$$

4. 12 men finished $\frac{1}{4}$ part of whole work in 6 days. Find the number of additional men required to complete the job in next 6 days.

a) 36   b) 12   c) 18   d) 24 ✓

$$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\Rightarrow \frac{12 \times 6}{1/4} = \frac{M_2 \times 6}{3/4}$$

$$\Rightarrow M_2 = 12 \times 3 = 36$$

$$\text{additional men} = 36 - 12$$
$$= 24$$

5. If $\cos x - 3\sin x = \sqrt{3}\sin x$, then the value of $\tan x$ is –

a) $\dfrac{3 - \sqrt{3}}{6}$ 　　　　　 b) $3 - \sqrt{3}$ 　　　　　 c) $\sqrt{3}$ 　　　　　 d) $3 + \sqrt{3}$

$$\cos x = 3\sin x + \sqrt{3}\sin x$$

$$\cos x = \sqrt{3}\sin x(\sqrt{3}+1)$$

$$\Rightarrow \frac{\cos x}{\sin x} = \sqrt{3}(\sqrt{3}+1) = 3 + \sqrt{3}$$

$$\Rightarrow \frac{\sin x}{\cos x} = \frac{1}{3 + \sqrt{3}}$$

$$\tan x = \frac{(3 - \sqrt{3})}{(3 + \sqrt{3})(3 - \sqrt{3})} = \frac{3 - \sqrt{3}}{3^2 - (\sqrt{3})^2} = \frac{3 - \sqrt{3}}{6}$$
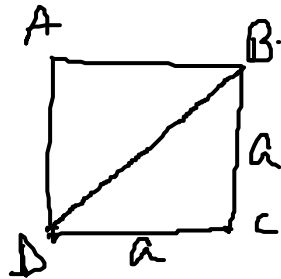
6. A square field of 2 square km area is to be divided into two equal parts by a fence that coincides with a diagonal. Find the length of the fence

a) $\sqrt{2}$ km   b) 2 km   c) 3 km   d) 1 km

$BD = ?$

area $= a^2 = 2$

$a = \sqrt{2}$

diagonal $BD = \sqrt{2} \cdot a$

$= \sqrt{2} \times \sqrt{2}$

$= 2$ km

7. If α and β are the roots of $x^2 - 5x + 3 = 0$, find the quadratic equation whose roots are α^2 and β^2.

a) $x^2 + 19x - 9 = 0$ b) $x^2 - 19x - 9 = 0$ c) $x^2 - 19x + 9 = 0$ d) $x^2 + 19x + 9 = 0$

$$\alpha^2, \beta^2 \qquad \alpha^2 + \beta^2 = 19$$
$$\alpha^2\beta^2 = 9$$

$$ax^2 + bx + c = 0 \qquad x^2 - 5x + 3 = 0$$

$$\text{roots } \alpha, \beta \qquad \alpha + \beta = -\left(\frac{-5}{1}\right) = 5$$

$$\alpha + \beta = -\frac{b}{a} \qquad \alpha\beta = 3$$

$$\alpha\beta = \frac{c}{a}$$

$$(\alpha + \beta)^2 = 5^2$$

$$x^2 - (\text{Sum})x + \text{product} = 0$$

$$x^2 - 19x + 9 = 0$$

$$\Rightarrow \alpha^2 + \beta^2 + 2\alpha\beta = 25$$

$$\Rightarrow \alpha^2 + \beta^2 + 2 \times 3 = 25$$

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

$$\alpha\beta = 3$$

$$\alpha^2\beta^2 = 9$$

8. A box contains 6 white, 2 black and 3 red balls. If a ball is drawn at random, what is the probability that it will not be white?

a) $\frac{5}{6}$

b) $\frac{6}{5}$

$6 + 2 + 3$
$= 11$

c) $\frac{5}{11}$

d) $\frac{6}{11}$

1 ball is white

$= \dfrac{{}^{6}C_1}{{}^{11}C_1} = \dfrac{6}{11}$

1 ball is not white $= 1 - \dfrac{6}{11} = \dfrac{5}{11}$

9. If the ratio of mean and median of a certain data is 4 : 5, find the ratio of its mean and mode?

a) 5 : 4 b) 5 : 7 c) 3:7 d) 4:7 ✓

$$\frac{mean}{median} = \frac{4}{5}$$

$$5\ mean = 4\ median$$

Mode = 3 median − 2 mean

$$= \frac{15}{4}\ mean - 2\ mean$$

$$mode = \frac{7}{4}\ mean$$

$$\frac{mode}{mean} = \frac{7}{4}$$

$$mean : mode = 4 : 7$$

$$4\ median = 5\ mean$$

$$1\ " = \frac{5}{4}\ "$$

$$3\ " = \frac{15}{4}\ "$$

10.

Village	Population	Literate : Illiterate
A	1500	2 : 3
B	4000	11 : 9
C	3000	13 : 2
D	5500	4 : 1

$\rightarrow 1500 \times \frac{2}{5} = 600$

$\rightarrow 4000 \times \frac{11}{20} = 2200$

$\rightarrow 3000 \times \frac{13}{15} = 2600$

$\rightarrow 5500 \times \frac{4}{5} = 4400$

9800

What is the percentage of literate people in all the four villages together?

a) 67%   b) 65%   c) 72%   d) 70%

14000

$\% \ literate = \frac{9800}{14000} \times 100$

$= 70\%$

11. Which of the following two successive discounts are equivalent to a single discount of 84%

a) 30% and 70% b) 20% and 80% c) 40% and 60% d) 10% and 90%

$$30 + 70 - \frac{30 \times 70}{100}$$

$$= 79\%$$

$$\times$$

$$20 + 80 - \frac{20 \times 80}{100}$$

$$= 100 - 16$$

$$= 84\%$$

12. Speed of a man in still water is $\frac{28}{3}$ km/hr. It takes him thrice as much time to row upstream as it takes to row downstream. What is the speed of stream? $, x$

a) $\frac{16}{3}$ km/hr   b) $\frac{14}{3}$ km/hr   c) $\frac{20}{3}$ km/hr   d) 6 km/hr

$$D.S. \; Time : U.S \; time = 1 : 3$$

$$Dist = S \times T$$

$$D.S. \; Speed \times D.S.T = U.S. \; Speed \times U.S. \; Time$$

$$\left(\frac{28}{3} + x\right) \times 1 = \left(\frac{28}{3} - x\right) \times 3$$

$$\frac{28}{3} + x = 28 - 3x$$

$$4x = 28 - \frac{28}{3} = \frac{56}{3}$$
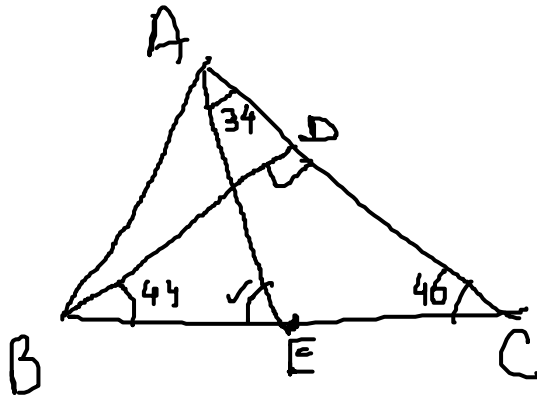
$$x = \frac{14}{3} \; km/hr$$

13. In $\triangle ABC$, $\underline{BD \perp AC}$ at D and $\angle DBC = 44^0$, E is a point on BC such that $\angle CAE = 34^0$. What is the measure of $\underline{\angle AEB}$?

a) 78^0 b) 80^0 c) 56^0 d) 46^0

$\angle BDC = 90$

$\angle DBC = 44$

$\angle C = 180 - (90 + 44)$

$= 46$

$\triangle AEC,$

$\angle AEB = \angle EAC + \angle ACE$

$= 34 + 46$

$= 80$

14. Find the value of –

$$\left[\frac{2\cos A}{(1-\sin A)} + \frac{2\cos A}{(1+\sin A)} \right] \times 3\sqrt{\sec^2 A - 1}$$

✓ a) 12 secA.tanA   b) 4secA   c) 18 secA.tanA   d) 12 tanA

$$= \frac{2\cos A(1+\sin A) + 2\cos A(1-\sin A)}{(1-\sin A)(1+\sin A)} \times 3\sqrt{\sec^2 A - 1}$$

$$\Rightarrow \frac{2\cos A + 2\cos A \sin A + 2\cos A - 2\cos A \sin A}{1-\sin^2 A} \times 3\sqrt{\tan^2 A}$$

$$= \frac{4\cos A}{\cos^2 A} \times 3\tan A = \frac{4}{\cos A} \times 3\tan A$$

$$= 4\sec A \, 3 \tan A$$

$$= 12 \, \sec A \, \tan A$$

15. The speed of a car increases by 2 kms after every one hour. If the distance travelled in the first one hour was 35 kms, what was the total distance travelled in 12 hours?

a) 456 kms b) 482 kms c) 552 kms d) 556 kms

$$35 + 37 + 39 + \text{-----}$$

A.P. Series

$$\text{Sum} = \frac{n}{2}\left\{2a + (n-1)d\right\}$$

$$= \frac{12}{2}\left\{2 \times 35 + 11 \times 2\right\}$$

$$= 6(70 + 22)$$

$$= 6 \times 92 = 552$$

$n = 12$

$a = 35$

$d = 2$

16. A copper wire having length of 243 mt and diameter 4 m.m. was melted to form a sphere. Find the diameter of the sphere.

$r_1 = 2\ mm$

$= \cdot 2\ cm$

a) 17 cm b) 18 cm c) 15 cm d) 20 cm

$h = 24300\ cm$

Vol of sphere = vol of copper wire

$$\frac{4}{3}\pi r^3 = \pi r_1^2 h$$

$$\Rightarrow \frac{4}{3} r^3 = \cdot 2 \times \cdot 2 \times 24300$$

$$r^3 = \frac{\cdot 2 \times \cdot 2 \times 24300 \times 3}{4}$$

$$r^3 = \frac{24300 \times 3}{100} = 3^5 \times 3 = 3^6$$

$$r = 3^2 = 9\ cm \quad , d = 18\ cm$$