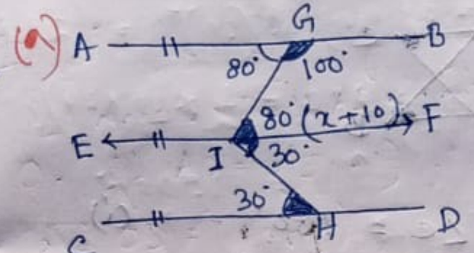
[A] GEOMETRY (ANSWERS) <12>

1. (a)



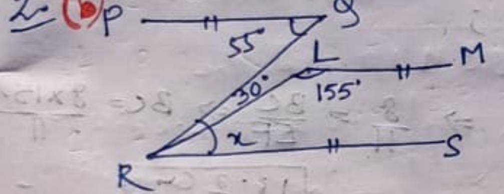
AB ∥ EF ∥ CD.

$\therefore \angle AGI = \angle GIF = 80°$ (Alternate angle)

Now; $\angle CHI = \angle FIH = 30°$ (Alternate angle)

$\therefore \angle GIH = 110°$; then $x + 10 = 110° \Rightarrow \boxed{x = 100°}$

2. (b)

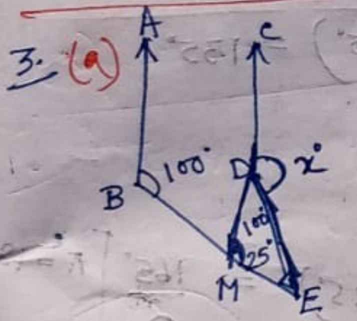


Now; $\angle PQR = \angle QRS = 55°$ (Alternate angle)

Now; $x + 30 = 55°$

$\Rightarrow x = \angle LRS = \boxed{25°}$

3. (a)



Extended CD to M. then

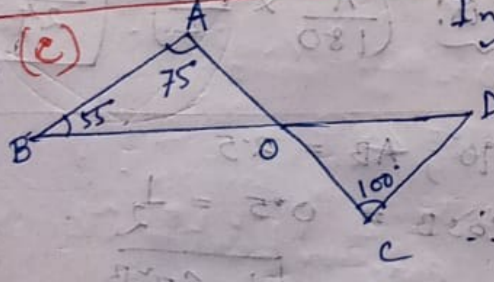
$\angle DME = \angle ABE = 100°$

$\angle MED = 25°$

$\therefore \angle MDE = \{180° - (100° + 25°)\} = 55°$

$\therefore \angle CDE = (180° - 55°) = \boxed{125°}$

1. (c)



In $\triangle AOB$;

$\angle AOB = \{180° - (55° + 75°)\}$

$= 50°$

$\therefore \angle AOB = \angle COD = 50°$ (Vert. opp. angle)

Now; In $\triangle COD$; $\angle ODC = \{180° - (100° + 50°)\}$

$= \boxed{30°}$

(A) GEOMETRY (ANSWERS) {15}

5. (a)

In $\triangle AEC$; $\angle A + \angle E + \angle C = 180^\circ \longrightarrow$ (i)

In $\triangle BFD$; $\angle B + \angle F + \angle D = 180^\circ \longrightarrow$ (ii)

Adding (i) & (ii); We get; $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F = \boxed{360^\circ}$

6. (b) $\dfrac{\text{area } \triangle ABC}{\text{area } \triangle DEF} = \dfrac{64}{121}$;

Now; $\dfrac{BC^2}{EF^2} = \dfrac{64}{121} \Rightarrow \dfrac{8}{11} = \dfrac{BC}{EF} \Rightarrow BC = \dfrac{8 \times 15.4}{11}$

$= \boxed{11.2 \text{ cm}}$

7. (a) $2x + 3x + 5x = (180^\circ - 45^\circ) = 135^\circ$

$\Rightarrow 10x = 135^\circ$

$\Rightarrow 5x = \left(\dfrac{135}{2}\right)^\circ$

$\therefore$ Largest angle $= \left(\dfrac{135}{2} + 15\right)^\circ = \dfrac{165^\circ}{2}$ $[\pi^c = 180^\circ]$

Required answer is: $\left(\dfrac{\pi}{180} \times \dfrac{165}{2}\right) = \boxed{\dfrac{11\pi}{24} \text{ radian}}$

8. (c)

$\angle ACB = 90^\circ$; $AB = 2.5$

$\therefore \cos B = 0.5 = \dfrac{1}{2}$

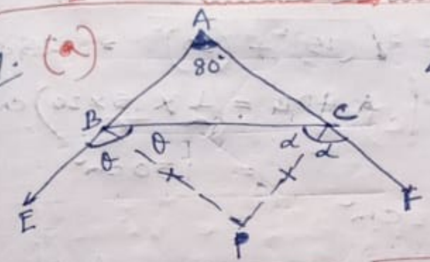
$\therefore \sin B = \sqrt{1 - \cos^2 B}$

$= \sqrt{1 - \dfrac{1}{4}} = \dfrac{\sqrt{3}}{2}$

$\therefore \sin B = \dfrac{AC}{AB} \Rightarrow AC = AB \sin B$

$= 2.5 \times \dfrac{\sqrt{3}}{2} = \boxed{\dfrac{5\sqrt{3}}{4} \text{ cm}}$

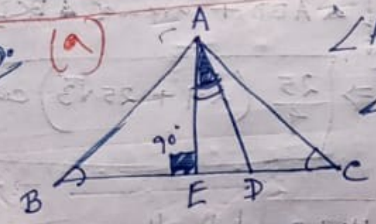
9. (a)



$\angle BPC = 90° - \frac{\angle BAC}{2}$

$= \left(90° - \frac{80°}{2}\right) = \boxed{50°}$

10. (a)



$\angle A = 60°$; $\angle C = 40°$

$\angle BAD = \angle DAC = \left(\frac{180° - 100°}{2}\right)$

$= 40°$

from $\triangle ABE$: $\angle BAE = \{180° - (60° + 90°)\} = 30°$

$\therefore \angle EAD = (40° - 30°) = \boxed{10°}$

11. (a) Exterior angle of a regular hexagon $= \frac{360°}{6} = 60°$

$\therefore$ Each of interior angles $= (180° - 60°) = 120°$

Each interior angle of the given polygon

$= \left(\frac{9}{8} \times 120°\right) = 135°$

$\therefore$ Each exterior angle of the given polygon $= (180° - 135°)$

$= 45°$

$\therefore n(\text{side}) = \left(\frac{360°}{45}\right) = \boxed{8}$

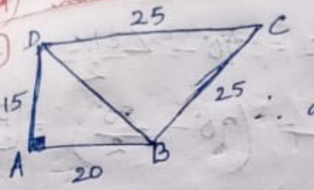
12. (c) Interior + Exterior = 180°

Interior − Exterior = 60°

Exterior angle $= \frac{180 - 60°}{2} = 60°$

$\therefore n(\text{side}) = \frac{360°}{60°} = \boxed{6}$

13.(a)



$BD = \sqrt{(15)^2 + (20)^2} = 25$ cm

$\therefore$ area of $\triangle ADB = \left(\frac{1}{2} \times 15 \times 20\right)$ cm^2

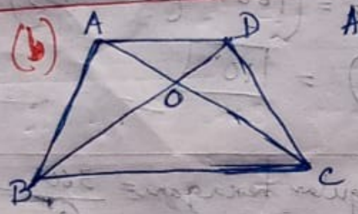
$= 150$ cm^2

area of $\triangle DBC = \frac{\sqrt{3}}{4} \times (25)^2$ cm^2

$\therefore$ Area of ▭ ABCD = area of $\triangle ABD$ + area of $\triangle BCD$

$= \left\{150 + \frac{\sqrt{3}}{4} \times (25)^2\right\} \Rightarrow \boxed{\frac{25}{4}\left(24 + 25\sqrt{3}\right) \text{ cm}^2}$

14. (b)



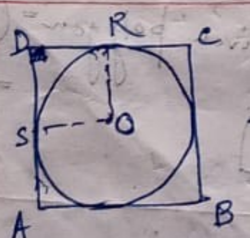
As $BC \parallel AD$ and the diagonals of a trapezium divide eachother proportionally.

so, $\frac{AO}{OC} = \frac{DO}{OB}$

$\Rightarrow \frac{3x-1}{5x-3} = \frac{2x+1}{6x-5}$

By option test, We can Write $\boxed{x = 2}$

15. (a)



O is Centre of the circle.

$\therefore$ RO = OS = radious.

$\angle ORD = \angle OSD = 90°$

$\therefore$ ORDS is a square.

Since tangents from an exterior point to a circle are equal in length.

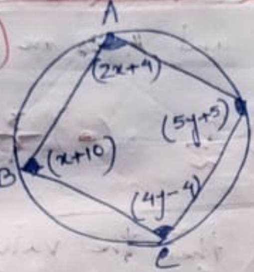
$\therefore$ BP = BQ ; CQ = CR and DR = DS

$\therefore$ CQ = (38 − 27) = 11 cm ; CR = 11 cm.

DR = (25 − 11) = 14 cm ; OR = DR = radious = $\boxed{14}$

(A) GEOMETRY (ANSWERS) ⟨16⟩

16 → (d)



As, $\angle B + \angle D = 180^\circ$ and $\angle A + \angle C = 180^\circ$

$\therefore x + 10 + 5y + 5 = 180^\circ$

$\Rightarrow x + 5y = 165^\circ \longrightarrow (i)$

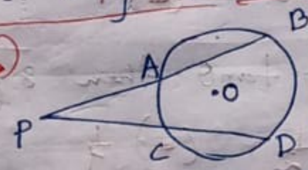
$2x + 4 + 4y - 4 = 180^\circ$

$\Rightarrow 2x + 4y = 180^\circ \Rightarrow x + 2y = 90^\circ \rightarrow (ii)$

By solving eqn (i) & eqn (ii), We get $x = 40^\circ$ and $y = 25^\circ$

$\therefore x + y = \boxed{65^\circ}$

17. (b)



$\because PA \times PB = PC \times PD$

$\Rightarrow 3 \times (3+5) = 2 \times PD$

$\Rightarrow PD = 12$

$\therefore CD = (PD - PC) = (12 - 2) = \boxed{10\ cm}$

18. (c)

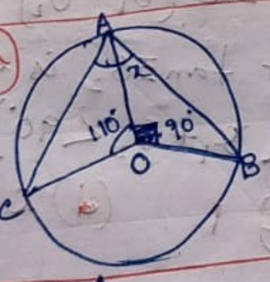
$PT^2 = PA \times PB$ [$\because AB = x$]

$\Rightarrow 4 \times (4 + x) = (5)^2$

$\Rightarrow 16 + 4x = 25$

$\Rightarrow 4x = 9 \Rightarrow x = \boxed{\frac{9}{4}\ cm}$

19 (a)

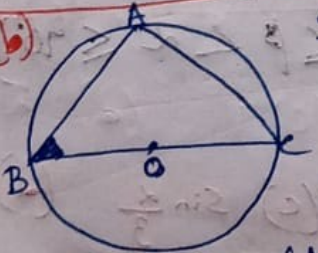


$\angle COB = \{360^\circ - (110^\circ + 90^\circ)\}$

$= 160^\circ$

$\angle CAB = x^\circ = \frac{1}{2}\angle COB = \boxed{80^\circ}$

20. (b)



Since an angle in a Semicircle is a right angle.

$\therefore \angle BAC = 90^\circ$

$\therefore \angle ABC + \angle ACB = 90^\circ$; Now $AB = AC$

$\therefore \angle ABC = \angle ACB = \boxed{45^\circ}$

1. (a) $\text{Cosec}^2 A - \cot^2 A = 1$

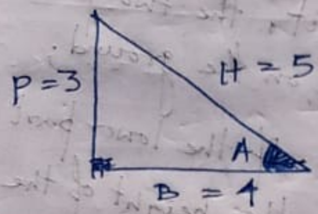
$\Rightarrow (\text{Cosec}\,A + \cot A)(\text{Cosec}\,A - \cot A) = 1$

$\therefore \quad \text{Cosec}\,A + \cot A = 3$

$\quad\;\; \text{Cosec}\,A - \cot A = \frac{1}{3}$

$2\,\text{Cosec}\,A = \frac{10}{3}$

$\Rightarrow \text{Cosec}\,A = \frac{5}{3} = \frac{H}{P}$



$\therefore \cos A = \frac{B}{H} = \boxed{\frac{4}{5}}$

2. (b) $\tan(x+y) \cdot \tan(x-y) = 1$

$\Rightarrow \tan(x+y) \cdot \tan(x-y) = \sqrt{3} \times \frac{1}{\sqrt{3}}$

$\therefore (x+y) = 60^\circ$ and $(x-y) = 30^\circ$

$\therefore x = 45^\circ$; then $\tan x \Rightarrow \tan 45^\circ \Rightarrow \boxed{1}$

3. (d) $\cot\frac{\pi}{20} \cdot \cot\frac{3\pi}{20} \cdot \cot\frac{5\pi}{20} \cdot \cot\frac{7\pi}{20} \cdot \cot\frac{9\pi}{20}$

$= \cot 9^\circ \cdot \cot 27^\circ \cdot \cot 45^\circ \cdot \cot 63^\circ \cdot \cot 81^\circ \quad [\pi = 180^\circ]$

$= (\cot 9^\circ \cdot \cot 81^\circ) \cdot (\cot 27^\circ \cdot \cot 63^\circ) \cdot \cot 45$

$= (\tan 9^\circ \cdot \cot 9^\circ) \cdot (\tan 63^\circ \cdot \cot 63^\circ) \cdot \cot 45^\circ$

$= 1 \cdot 1 \cdot 1$

$\left[\begin{array}{l} \because \tan(90^\circ - \theta) \rightleftharpoons \cot\theta \\ \tan\theta \cdot \cot\theta = 1 \\ \cot 45^\circ = 1 \end{array}\right]$

$= \boxed{1}$

4. (C) $4x = \sec\theta$ and $\frac{4}{x} = \tan\theta$

Now; $\sec^2\theta = 16x^2$ and $\tan^2\theta = \frac{16}{x^2}$

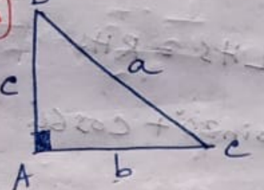
$\therefore \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow 16x^2 - \frac{16}{x^2} = 1$

$2\left(8x^2 - \frac{1}{8x^2}\right) = 1$

$\Rightarrow 8\left(x^2 - \frac{1}{x^2}\right) = \boxed{\frac{1}{2}}$

5. (d)



$\tan B = \frac{b}{c}$ $\left[\because \tan\theta = \frac{P}{B}\right]$

$\tan C = \frac{c}{b}$

$\therefore \tan B + \tan C = \frac{b}{c} + \frac{c}{b} = \frac{b^2+c^2}{bc}$

$= \boxed{\frac{a^2}{bc}}$ $\left[\because a^2 = (b^2+c^2)\right]$

6. (d) $\tan(\theta_1+\theta_2) = \sqrt{3} = \tan 60^\circ$

$\therefore \theta_1+\theta_2 = 60^\circ \longrightarrow$ (i)

$\sec(\theta_1-\theta_2) = \frac{2}{\sqrt{3}} = \sec 30^\circ$

$\therefore \theta_1-\theta_2 = 30^\circ \longrightarrow$ (ii)

By solving eq^n(i) and eq^n(ii); We get

$\theta_1 = 45^\circ$ and $\theta_2 = 15^\circ$

$\sin 2\theta_1 + \tan 3\theta_2 \Rightarrow (\sin 90^\circ + \tan 45^\circ) \Rightarrow (1+1)$

$= \boxed{2}$

7. (b) Now put $\alpha = 90^\circ$ and $\beta = 0^\circ$

$\sin\left(\frac{2\alpha+\beta}{3}\right) \Rightarrow \sin\left(\frac{180^\circ}{3}\right) \Rightarrow \sin 60^\circ \Rightarrow \frac{\sqrt{3}}{2}$

$\therefore$ By the option we get; $\cos\frac{\alpha}{3} = \cos 30^\circ = \frac{\sqrt{3}}{2}$

then the required answer is $\boxed{\cos\frac{\alpha}{3}}$

8 (a) $\sin\alpha . \sec(30^\circ+\alpha) = 1$

if put $\alpha = 30^\circ$; then LHS = RHS

$\therefore (\sin\alpha + \cos 2\alpha) \Rightarrow \sin 30^\circ + \cos 60^\circ$

$= \left(\frac{1}{2}+\frac{1}{2}\right) = \boxed{1}$

9. (c) Now, $\angle A + \angle B + \angle C = 180^\circ$

Let $\angle A = 30^\circ$; $\angle B = 60^\circ$ and $\angle C = 90^\circ$

$L.H.S \Rightarrow \tan\left(\frac{A+B}{2}\right) \Rightarrow \tan\left(\frac{90^\circ}{2}\right) \Rightarrow \tan 45^\circ \Rightarrow 1$

$RHS \Rightarrow \sec\frac{C}{2} \Rightarrow \sec\left(\frac{90}{2}\right) \Rightarrow \sec 45^\circ \Rightarrow \sqrt{2}$

$\therefore$ LHS $\neq$ RHS

The Required answer is $\boxed{(c)}$

10. (b) Let put $\theta = 45^\circ$;

$\therefore \sin\theta + \cos\theta = p$

$\Rightarrow p = \left(\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{2}}\right) = \sqrt{2}$

$\sec\theta + \operatorname{cosec}\theta = q$

$\Rightarrow q = (\sqrt{2}+\sqrt{2}) = 2\sqrt{2}$

$\therefore q(p^2-1)$

$= 2\sqrt{2}(2-1)$

$= 2\sqrt{2}$

By option we can say that $2p = 2\sqrt{2}$

$\therefore$ Required answer is $\boxed{(b)}$.

11. (d) Let $\theta = 45^\circ$

$\therefore \; l = (\operatorname{cosec}\theta - \sin\theta) \Rightarrow \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right) \Rightarrow \frac{1}{\sqrt{2}}$

$m = (\sec\theta - \cos\theta) \Rightarrow \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right) \Rightarrow \frac{1}{\sqrt{2}}$

$\therefore \; l^2m^2\left(l^2+m^2+3\right)+3$

$= \left\{\frac{1}{4}\left(\frac{1}{2}+\frac{1}{2}+3\right)+3\right\} = \boxed{4}$

12. (d) Let put $\theta = 45^\circ$;

$\therefore \; x\sin^3\theta + y\cos^3\theta = \sin\theta \cdot \sin\theta$

$\Rightarrow \frac{x}{2\sqrt{2}} + \frac{y}{2\sqrt{2}} = \frac{1}{2}$

$\Rightarrow (x+y) = \sqrt{2} \longrightarrow$ (i)

$x\sin\theta = y\cos\theta$

$\therefore \; x = y \rightarrow$ (ii)

Now put the value of 'x' from eq^n (ii) in eq^n (i)

$2x = \sqrt{2} \Rightarrow x = \frac{1}{\sqrt{2}}$

$\therefore$ Now $x = y = \frac{1}{\sqrt{2}}$

$\therefore \; x^2+y^2 \Rightarrow \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 \Rightarrow \boxed{1}$

13. (b) Let $\alpha = \sin\theta$ and $\beta = \cos\theta$

$\therefore$ We know that, from the given equation,

We can write $\rightarrow (\alpha+\beta) = \frac{b}{a}$ and $\alpha\beta = \frac{c}{a}$

$\therefore \; \sin\theta + \cos\theta = \frac{b}{a}$

$\Rightarrow (\sin\theta+\cos\theta)^2 = \frac{b^2}{a^2}$

$\Rightarrow 1 + 2\sin\theta\cos\theta = \frac{b^2}{a^2}$

$\Rightarrow 1 + \frac{2c}{a} = \frac{b^2}{a^2}$

$\Rightarrow \frac{a+2c}{a} = \frac{b^2}{a^2}$

$\Rightarrow a^2 + 2ca = b^2$

$\Rightarrow \boxed{a^2 - b^2 + 2ca = 0}$

14. (b) Let put $\theta = 45°$

$\therefore T_n = \sin^n\theta + \cos^n\theta$

$\Rightarrow T_3 = \sin^3\theta + \cos^3\theta \Rightarrow \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}} \longrightarrow$ (i)

$\Rightarrow T_5 = \sin^5\theta + \cos^5\theta \Rightarrow \frac{2}{4\sqrt{2}} = \frac{1}{2\sqrt{2}} \longrightarrow$ (ii)

$\Rightarrow T_1 = \sin\theta + \cos\theta \Rightarrow \sqrt{2}$

$\therefore \frac{T_3 - T_5}{T_1} \Rightarrow \frac{\frac{1}{\sqrt{2}} - \frac{1}{2\sqrt{2}}}{\sqrt{2}} \Rightarrow \frac{\frac{1}{\sqrt{2}} \cdot \frac{1}{2}}{\sqrt{2}} \Rightarrow \frac{1}{2\sqrt{2}} \times \frac{1}{\sqrt{2}}$

$= \frac{1}{4}$

Now from option; putting $\theta = 45°$; we get $\sin^2\theta\cos^2\theta = \frac{1}{4}$

Then, the required answer is $\boxed{\sin^2\theta\cos^2\theta}$.

15. (d) $3\sin\theta + 5\cos\theta = 5$

Let $a = 3$; $b = 5$ and $c = 5$

$\therefore 5\sin\theta - 3\cos\theta \Rightarrow \pm\sqrt{a^2+b^2-c^2} \Rightarrow \boxed{\pm 3}$

16. (d) $x = a\sec\theta \cdot \cos\phi$

$\Rightarrow \frac{x^2}{a^2} = \sec^2\theta\cos^2\phi$

$y = b\sec\theta \cdot \sin\phi$

$\Rightarrow \frac{y^2}{b^2} = \sec^2\theta \cdot \sin^2\phi$

Now; $\frac{z^2}{c^2} = \tan^2\theta$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = \sec^2\theta(\sin^2\phi + \cos^2\phi) - \tan^2\theta$

$= (\sec^2\theta - \tan^2\theta)$

$= \boxed{1}$

17. (a) $\cos\theta + \cos^2\theta = 1 \Rightarrow \cos\theta = \sin^2\theta \Rightarrow \sin^4\theta = \cos^2\theta$

$\sin^{12}\theta + 3\sin^{10}\theta + 3\sin^8\theta + \sin^6\theta + 2\sin^4\theta + 2\sin^2\theta - 2$

$= (\sin^4\theta)^3 + 3\cdot(\sin^4\theta)^2\cdot\sin^2\theta + 3\cdot\sin^4\theta\cdot(\sin^2\theta)^2 + (\sin^2\theta)^3 + 2\sin^4\theta + 2\sin^2\theta - 2$

Let put $a = \sin^4\theta$ and $b = \sin^2\theta$

Now the above equation is $\longrightarrow$

$= a^3 + 3a^2b + 3ab^2 + b^3 + 2\sin^4\theta + 2\sin^2\theta - 2$

$= (a+b)^3 + 2(\sin^4\theta + \sin^2\theta - 1)$

$= (\sin^4\theta + \sin^2\theta)^3 + 2(\cos^2\theta + \sin^2\theta - 1)$ $[\because \sin^4\theta = \cos^2\theta]$

$= (\cos^2\theta + \sin^2\theta)^3$

$= \boxed{1}$

18. (a) Let put $\theta = 45°$

$\therefore a = \tan\theta - \cot\theta = 0 \longrightarrow$ (i)

$b = \cos\theta - \sin\theta = 0 \longrightarrow$ (ii)

Now putting the value of a and b in given eq^n.

$\therefore (a^2 + 4)(b^2 - 1)^2$

$= \boxed{4}$

19. (a) $\sec x + \cos x = 3$

$\Rightarrow (\sec x + \cos x)^2 = 9$

$\Rightarrow \sec^2 x + \cos^2 x + 2\sec x.\cos x = 9$ $[\because \sec x \cos x = 1]$

$\Rightarrow \sec^2 x + \cos^2 x = 7$

Now; $(\tan^2 x - \sin^2 x) \Rightarrow (\sec^2 x - 1) - (1 - \cos^2 x)$

$= \sec^2 x + \cos^2 x - 2 \Rightarrow \boxed{5}$ $[\because \sec^2 x - \tan^2 x = 1]$

20. (b) put $\theta = 90^\circ$; we get →

$2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$

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

21. (b) $\cos^2\theta + \cos^4\theta = 1$

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

$\Rightarrow \cos^2\theta = \dfrac{\sin^2\theta}{\cos^2\theta}$

$\Rightarrow \cos^2\theta = \tan^2\theta$

$\Rightarrow \cos^4\theta = \tan^4\theta$

$\therefore \tan^2\theta + \tan^4\theta$

$= \cos^2\theta + \cos^4\theta \Rightarrow \boxed{1}$

22. (c) Let put $\theta = 45^\circ$

$(\sec\theta - \cos\theta)^2 + (\operatorname{cosec}\theta - \sin\theta)^2 - (\cot\theta - \tan\theta)^2$

$= \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right)^2 + \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right)^2 - (1-1)^2$

$= \left(\frac{1}{2} + \frac{1}{2}\right) \Rightarrow \boxed{1}$

23. (b) $7\sin^2\theta + 3\cos^2\theta = 4$

$\Rightarrow 4\sin^2\theta + 3\sin^2\theta + 3\cos^2\theta = 4$

$\Rightarrow 4\sin^2\theta = 1$

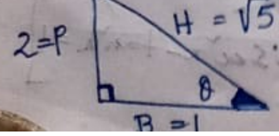
$\Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ$

Now; $\tan\theta \Rightarrow \tan 30^\circ \Rightarrow \boxed{\frac{1}{\sqrt{3}}}$

24. (c) $\dfrac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$

$\Rightarrow \sin\theta + \cos\theta = 3\sin\theta - 3\cos\theta$

$\Rightarrow \tan\theta = 2 = \frac{P}{B}$



$\sin\theta = \frac{P}{H} = \frac{2}{\sqrt{5}}$

$\cos\theta = \frac{B}{H} = \frac{1}{\sqrt{5}}$

$\therefore \sin^4\theta - \cos^4\theta$

$= \left(\frac{2}{\sqrt{5}}\right)^4 - \left(\frac{1}{\sqrt{5}}\right)^4$

$= \left(\frac{16}{25} - \frac{1}{25}\right)$

$= \boxed{\frac{3}{5}}$

25. (b) $\cos^2\alpha + \cos^2\beta = 2$

Let put $\cos^2\alpha = \cos^2\beta = 1$

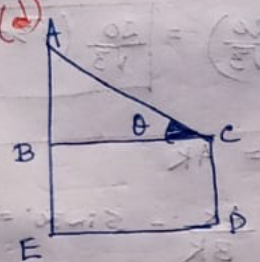
$\cos^2\alpha = 1$
$\Rightarrow \cos\alpha = 1$
$\Rightarrow \alpha = 0^\circ$

$\cos^2\beta = 1$
$\Rightarrow \cos\beta = 1$
$\Rightarrow \beta = 0^\circ$

Now $\alpha = \beta = 0^\circ$

then, $(\tan^3\alpha + \sin^5\beta) \Rightarrow (0 + 0) \Rightarrow \boxed{0}$

26. (d)

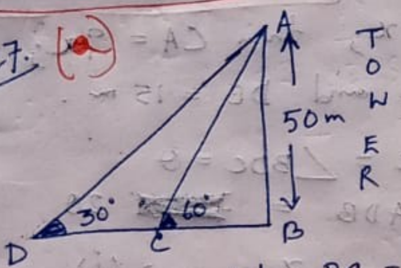


$BE = CD = $ height of man $= 2m$

$$\tan\theta = \frac{AB}{BC} = \left(\frac{\frac{10}{3} - 2}{\frac{4}{\sqrt{3}}}\right) = \left(\frac{4}{3} \times \frac{\sqrt{3}}{4}\right) = \frac{1}{\sqrt{3}}$$

$\tan\theta = \tan 30^\circ \Rightarrow \boxed{\theta = 30^\circ}$

27. (a)



Let D = 1st Car
C = 2nd Car
∴ DC = Distance between the two Cars.

Now, let $BC = x$; $DC = y$; $DB = (x+y)$

∴ $\triangle ABC$; $\frac{50}{x} = \tan 60^\circ = \sqrt{3}$

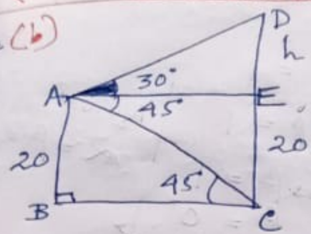
$\Rightarrow x = \frac{50}{\sqrt{3}} \longrightarrow$ (i)

$\triangle ABD$; $\frac{50}{(x+y)} = \tan 30^\circ = \frac{1}{\sqrt{3}}$

$\Rightarrow (x+y) = 50\sqrt{3} \longrightarrow$ (ii)

∴ $y = \left(50\sqrt{3} - \frac{50}{\sqrt{3}}\right) \Rightarrow \boxed{\frac{100}{\sqrt{3}}\ m}$

28. (b)



Let AB and CD are the pillars

Let DE = h ; DC = (20 + h) m

From △ADE

$\Rightarrow \frac{h}{AE} = \tan 30° = \frac{1}{\sqrt{3}}$

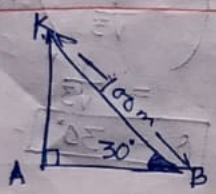
$\Rightarrow AE = \sqrt{3}h \longrightarrow (i)$

From △ACB ; $\tan 45° = \frac{20}{BC} \Rightarrow BC = 20 \rightarrow (ii)$

Now; AE = BC ; $\sqrt{3}h = 20 \Rightarrow h = \frac{20}{\sqrt{3}}$

$\therefore$ Required height $= \left(20 + \frac{20}{\sqrt{3}}\right) = \boxed{\frac{20}{\sqrt{3}}(\sqrt{3}+1)\,m}$

29 (d)

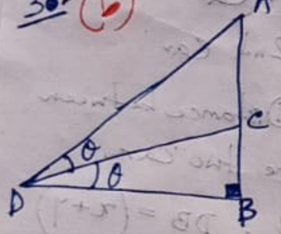


Height of kite = AK

In △BAK; $\frac{AK}{BK} = \sin 30° = \frac{1}{2}$

$\Rightarrow AK = \frac{100}{2} = \boxed{50m}$

30. (b)



Let BC = x ; then CA = 9x ;

AB = 10x and DB = 15 m.

Now; ∠ADC = ∠BDC = θ

$\therefore \angle ADB = 2\theta$

In △BDC; $\tan\theta = \frac{BC}{BD} = \frac{x}{15} \longrightarrow (i)$

In △ADB ; $\tan 2\theta = \frac{AB}{BD} = \frac{10x}{15} = \frac{2x}{3}$

$\Rightarrow \frac{2\tan\theta}{1-\tan^2\theta} = \frac{2x}{3}$ $\left[\because \frac{x}{15} = \tan\theta\right]$

$\Rightarrow \frac{\frac{2x}{15}}{\frac{225 - x^2}{225}} = \frac{2x}{3}$

$\Rightarrow \boxed{x = 6\sqrt{5}}$

—x—