1. $2x^2 + kx + 2 = 0$

Equal roots

$\Rightarrow k^2 = 4 \cdot 2 \cdot 2$

$\Rightarrow k = \pm 4$ Ans.

2. a) $0.8 + 1.2 = 2$

$2.0 - 0.8 = 2$

yes

b) $3 + \sqrt{2} - 3 = \sqrt{2}$

$3 + 2\sqrt{2} - 3 - \sqrt{2} = \sqrt{2}$

yes

c) $\frac{7}{3} - \frac{4}{3} = 1 \neq$

$\frac{9}{3} - \frac{7}{3} = \frac{2}{3}$

No.

d) yes.

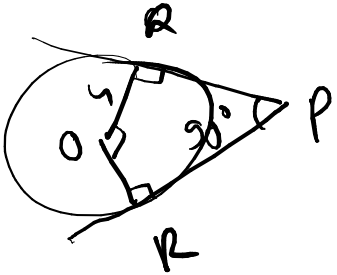
3. $\frac{4}{3}\pi r^3 = 12\pi$

$\Rightarrow r^3 = 3^2 \Rightarrow r = 3^{2/3}$ Ans.

4. $\left\| \begin{pmatrix} m \\ n \end{pmatrix} - \begin{pmatrix} -m \\ n \end{pmatrix} \right\| = 2 \left\| \begin{pmatrix} m \\ n \end{pmatrix} \right\|$

$= 2\sqrt{m^2+n^2}$ Ans

5.



PQOR is a square, $PQ = 4$.

8 a) $x = \frac{10+4}{2} = 7$

point is $\begin{pmatrix} 7 \\ 0 \end{pmatrix}$.

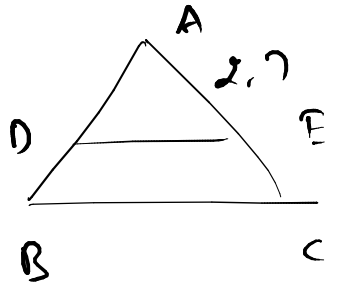
b) $O = \frac{\begin{pmatrix} -6 \\ 3 \end{pmatrix} + \begin{pmatrix} 6 \\ 4 \end{pmatrix}}{2} = \begin{pmatrix} 0 \\ 7/2 \end{pmatrix}$

Ans.

6. $p(x) = (x^2 - 4)(x + 3)$

$= x^3 - 4x + 3$ Ans.

7.



$$\frac{AD}{DB} = \frac{3}{2} = \frac{AE}{EC}$$

$$\Rightarrow EC = \frac{2AE}{3} = \frac{2 \times 2.7}{3}$$

$$= 1.8$$

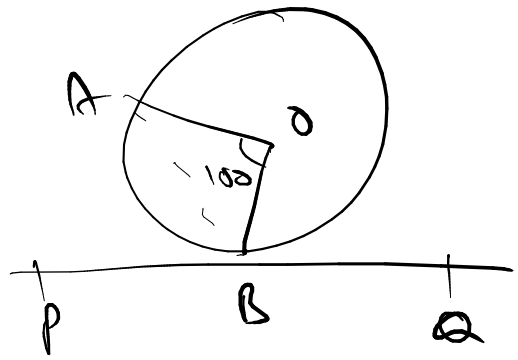
9. $\frac{3x}{2} + \frac{5y}{3} = 7 \Rightarrow 9x + 10y = 42$

$9x + 10y = 14.$

parallel lines.

inconsistent

10.



$\angle ABP = \frac{1}{2} \angle AOB = 50°$

11. $\frac{4\tan^2 A}{4\cosh^2 A} = \tan^2 A$

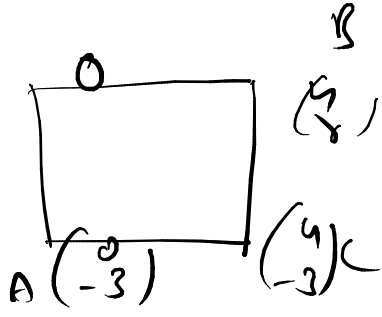
12. $P(E) = 0.023$ $P(\bar{E}) = 1 - 0.023$

$= 0.977$

13. Parallel

14. 1

15. $|OC| = 5$ Ans.



16. $\sin^2 30 + \cos^2 60$

$= \sin^2 30 + \sin^2 30$

$= 2\sin^2 30 = 2 \times \frac{1}{4} = \frac{1}{2}$.

17. a) $x^2 + 3x + 2 = 0$

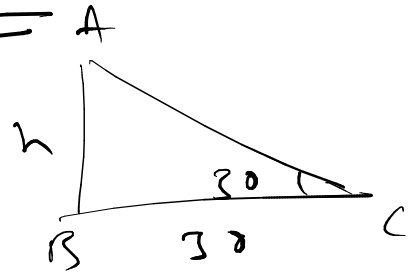
b) No.

18. $\frac{100 \times 101}{2} = 5050$ Ans.

19. $\frac{26 \times P}{13} = 182$

$\Rightarrow P = 91$ Ans.

20.



$h = 30 \tan 30$

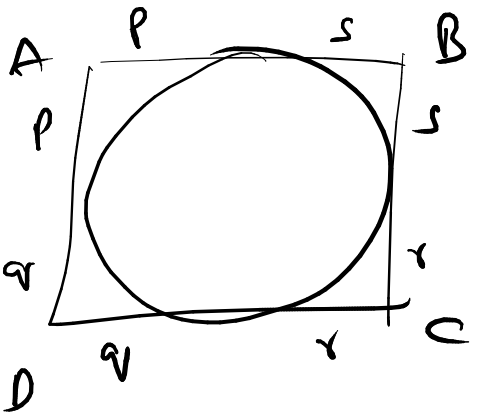
$= 30/\sqrt{3} = 10\sqrt{3}$ Ans.

21. $V_1 = \pi r^2 h$

$V_2 = \frac{1}{3} \pi r^2 \times 3h$

$V_1 = V_2$

22. a)



$AD = p + q$

$BC = s + r$

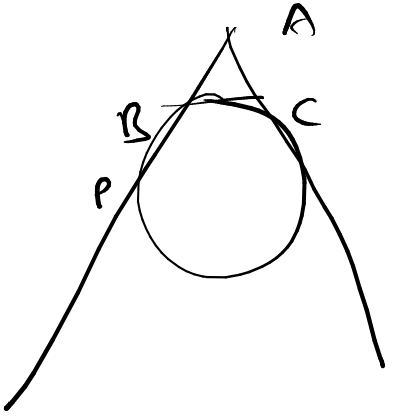
$CD = q + r$

$AB = s + p$

$AB + CD = p + q + r + s$

$AD + BC = p + q + r + s$

b)



$AP = 12 = AQ.$ — (1)

$BP = BD$ — (2)

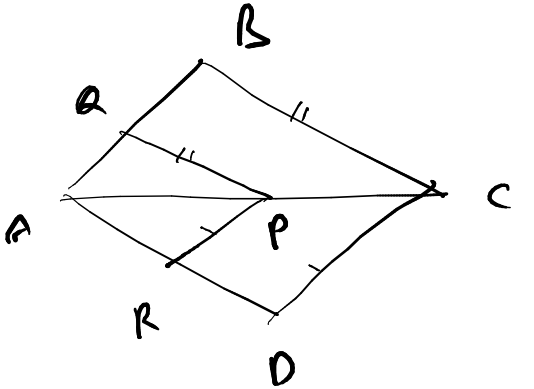
$CQ = CD$ — (3)

$AB + BD + CD + AC$

$= AB + BP + AC + CQ$

$= AP + AQ = 2AP = \underline{\underline{24}}$ Ans.

24.



$$\left.\begin{aligned} \frac{AQ}{QB} &= \frac{AD}{PC} \\ \frac{AR}{RD} &= \frac{AD}{PC} \end{aligned}\right\} \Rightarrow \frac{AQ}{QB} = \frac{AR}{RD}$$

25. $5 + 2\sqrt{7} = \frac{p}{q}$

$\Rightarrow \frac{1}{2}\left(\frac{p}{q} - 5\right) = \sqrt{7}$ is rational.

$\frac{l}{m} = \sqrt{7} \Rightarrow l^2 = 7m^2$.

Contradiction

25 b $12^n = k \times 10$

$\Rightarrow \frac{12^n}{10} = k$. a whole number

26. $\cos\left(\frac{B+C}{2}\right) = \cos\left(\frac{180-A}{2}\right)$

$= \cos\left(90 - \frac{A}{2}\right) = \sin\frac{A}{2}$

27. $\left(\sin^4\theta - \cos^4\theta + 1\right)\operatorname{cosec}^2\theta$

$= \left(\sin^2\theta - \cos^2\theta + 1\right)\operatorname{cosec}^2\theta$

$= 2\sin^2\theta \operatorname{cosec}^2\theta = 2$

28. $a = -5 \quad l = -230.$

$d = -3 \quad \Rightarrow n = 76$

$l = a + (n-1)d$

$\Rightarrow -230 = -5 + (n-1)(-3)$

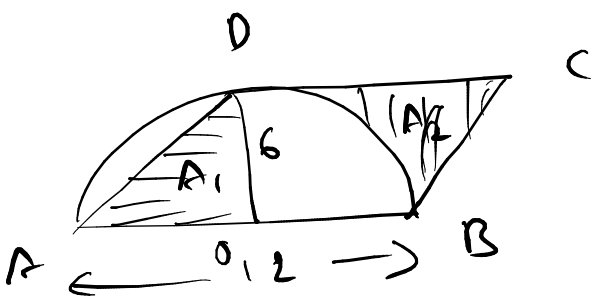
$$S = \frac{76}{2}(-5-238)$$

$$= 38 \times -243$$

$$= 19 \times -470$$

$$= -8930 \quad \text{Ans.}$$

30.



$$ar(ABCO) = 12 \times 6$$

$$ar(OBD) = \frac{1}{4} \times \pi \times 6^2$$

$$= 9\pi$$

$$ar(\text{Shaded region}) = 72 - 9\pi \text{ Ans}$$

31. Let $x \in \{1, 2, 4, 6, 8, 10\}$

$$P_r(x \neq 1) = \frac{5}{6}.$$

$y \in \{0, 1\}$, 0 is black.

$$P_r(y=0) = \frac{6}{6+14} = \frac{6}{20}$$

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

(i) Required prob $= P_r(x \neq 1)$

$$= \frac{5}{6}.$$

(ii) $P_r(y=0 \mid x \neq 1) = \frac{3}{10}$ Ans.

32. a) $$\frac{p-1}{q} = \frac{1}{3} \quad -(1)$$

$$\frac{p}{q+8} = \frac{1}{4}$$

$\Rightarrow$ $3p - q = 3$

$4p - q = 8$

$\Rightarrow$ $p = 5, \quad q = 12.$

$\frac{p}{q} = \frac{5}{12}$

b) $x = 3 + 3y$

$x + 3 = 10 + 2y$

$\Rightarrow$ $3 + 3y = 7 + 2y$

$\Rightarrow$ $y = 4$

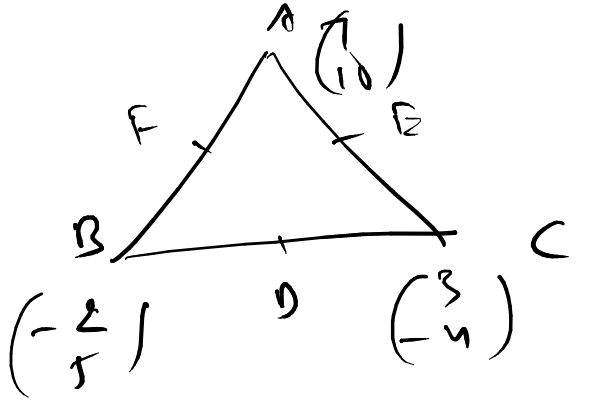
$x = 15$ Ans.

33. a) $k\begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} -2 \\ -7 \end{pmatrix} = \begin{pmatrix} 0 \\ y \end{pmatrix}$

$k + 1$

$\Rightarrow$ $k = \frac{1}{3}$ $\quad y = \frac{-\frac{4}{3} - 7}{4/3} = -\frac{25}{4}$

b)



$$\|A-B\|^2 = 9^2 + 5^2$$

$$\|B-C\|^2 = 5^2 + 9^2.$$

$$\|A-B\| = \|B-C\|$$

$$\Rightarrow AB = BC \quad \text{Ans.}$$

34. If p even,

$$p = 3k, 3k-1, 3k+1$$

$$\Rightarrow p^2 = 9k^2,\ 9k^2-6k+1,$$

$$= 3q \qquad 9k^2+6k+1 \rightarrow 3q+1$$

35. a) $x^2+y^2 = 544$

$4x - 4y = 32$

$\Rightarrow x - y = 8.$

$x^2+y^2-2xy = 544 - 2xy$

$\Rightarrow (x-y)^2 = 544 - 2xy = 64$

$\Rightarrow 2xy = 480 \Rightarrow xy = 240.$

$(x+y)^2 = 544 + 2xy$

$= 544 + 480$

$= 1024$

$\Rightarrow x+y = 32.$

$x-y = 8$

$x = 20, \quad y = 12$ Ans

b) $$\frac{24}{18-x} = 1 + \frac{24}{18+x}.$$

$$24\left(\frac{1}{18-x} - \frac{1}{18+x}\right) = 1$$

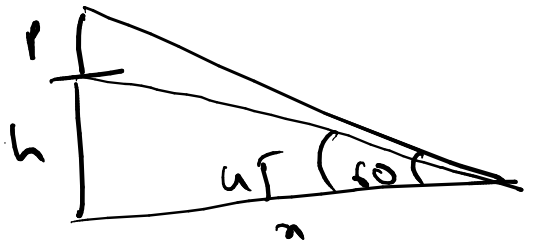
$$\frac{24 \times 2x}{18^2 - x^2} = 1$$

$$\Rightarrow x^2 + 48x - 18^2 = 0$$

$$\Rightarrow x = \frac{-48 + \sqrt{48^2 + 4 \cdot 18^2}}{2}$$

$$= \frac{-48 + 60}{2} = \underline{\underline{6}} \text{ Ans.}$$

37.



$$h - p = x \tan 60$$

$$h = x \tan 45$$

$$(h-p)\cos 60 = h \cos 45$$

$$\Rightarrow p \cos 60 = h(\cos 45 - \cos 60)$$

$$\Rightarrow h = \frac{p \cos 60}{\cos 45 - \cos 60}$$

$$= \frac{1.6 \times 1/\sqrt{3}}{1 - \frac{1}{\sqrt{3}}}$$

$$= \frac{1.6}{\sqrt{3}-1}$$ Ans.

38. a) $p(x) = 2x^4 - x^3 - 11x^2 + 5x + 5$

$q(x) = (x - \sqrt{5})(x + \sqrt{5})$

$= x^2 - 5$

$p(x)$ / $q(x)$

$$x^2 - 5 \;\overline{)\; 2x^4 - x^3 - 11x^2 + 5x + 5 \;}\; \Big| \; 2x^2 - x - 1$$

$$-(2x^4 \quad + 10x^2)$$

$$-x^3 - x^2 + 5x + 5$$

$$+(x^3 \quad - 5x)$$

$$-x^2 + 5$$

$r(x) = 2x^2 - x - 1$

$r(x) = 0$

$\Rightarrow x = \dfrac{1 \pm \sqrt{1+8}}{4}$

$= \dfrac{1 \pm 3}{4} = 1, -\dfrac{1}{2}$ Ans.

h) $x^2 - 4x + 8 \overline{)2x^3 - 3x^2 + 6x + 7}$ $\quad 2x + 5$

$-2x^3 + 8x^2 \mp 16x$

$5x^2 - 10x + 7$

$-5x^2 + 20x \mp 40$

$10x - 33.$

$p(x)$ to be added is $-10x + 33.$

39. Total volume of balls

$= \frac{4}{3}\pi (0.5)^3 \times 9000$

$= 4\pi \times 125 \times 3$

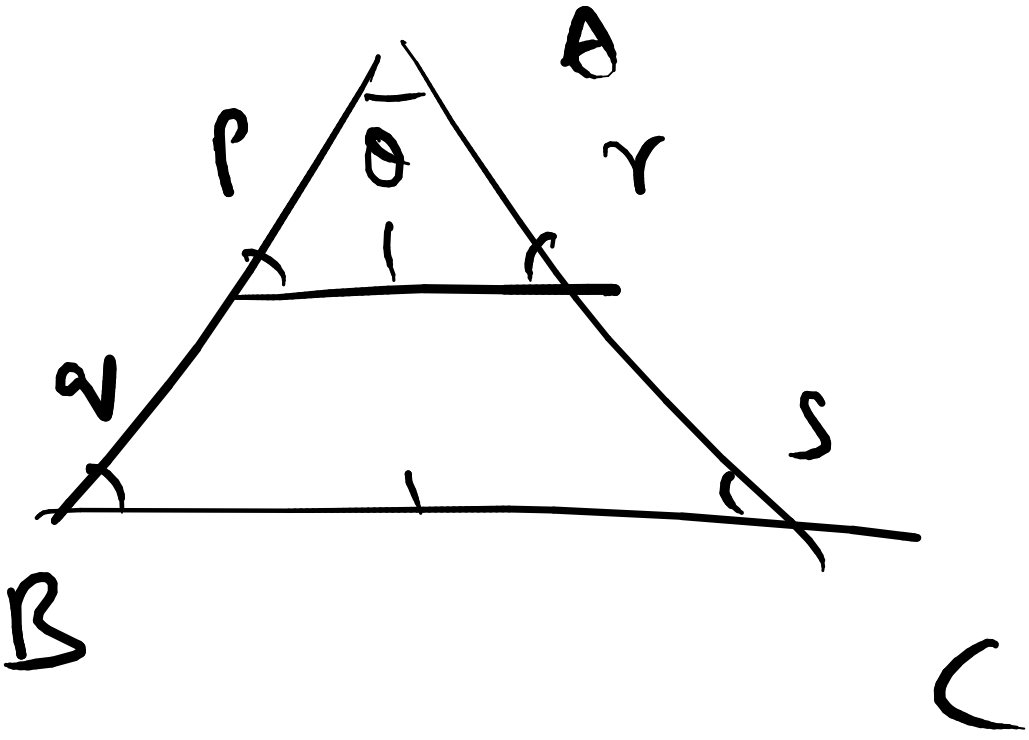
$= 1500\pi$

Volume of water rise $= 1500\pi$

$\pi \times 10^2 \times h = 1500\pi \Rightarrow h = 15$ cm

— Ans

40.



Similar triangles.