X Model Exam Set-1 (Answers)

1) $98 = 7^2 \times 2$ (a)

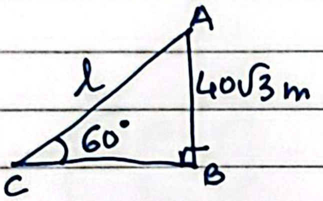
$$\begin{array}{r|l} 7 & 98 \\ \hline 7 & 14 \\ \hline & 2 \end{array}$$

2) $4x^2 - 12x + 9 = (2x-3)(2x-3)$

$\therefore$ the zeroes are $\frac{3}{2}, \frac{3}{2}$ (a)

3) mode = 3 median − 2 mean (c)

4)



$\sin 60° = \frac{AB}{AC}$

$\Rightarrow \frac{\cancel{\sqrt{3}}^1}{2} = \frac{40\cancel{\sqrt{3}}^1}{l}$

$\therefore l = 80m$ (c)

5) $2\pi r = 132$

$2 \times \frac{22}{7} \times r = 132$

$r = \frac{\cancel{132}^{\cancel{66}\,3} \times 7}{\cancel{2} \times 22} = 21cm$ (a)

6) $d = \sqrt{x^2+y^2} = \sqrt{a^2\cos^2\theta + a^2\sin^2\theta} = \sqrt{a^2(\sin^2\theta + \cos^2\theta)}$

$= \sqrt{a^2} = a$ (d)

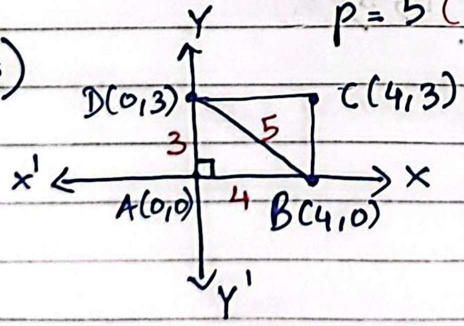
7) $\cancel{3}p + 5 - \cancel{3}p + 1 = 5p + 1 - 3p - 5$

$6 = 2p - 4$

$2p = 10$

$p = 5$ (b)

8)



diagonal $BD = \sqrt{3^2+4^2} = \sqrt{25} = 5$ units (a)

9) $\triangle PAB \sim \triangle PQR$ (AA Similarity)

$\frac{PA}{PQ} = \frac{PB}{PR} = \frac{AB}{QR} \Rightarrow \frac{2.4}{6} = \frac{2}{x}$

$\Rightarrow x = \frac{\cancel{2}^1 \times 6}{\cancel{2.4}\,1.2} = \frac{60}{12} = 5cm$ (c)

10) $\angle OAB = \frac{1}{2} \angle APB = 30^\circ$ (a)

11)

C.I	c.f	f
0-10	3	3
10-20	12	9
20-30	27	15
$\boxed{30-40}$	57	30
40-50	75	18
50-60	80	5

Modal class is 30-40 (c)

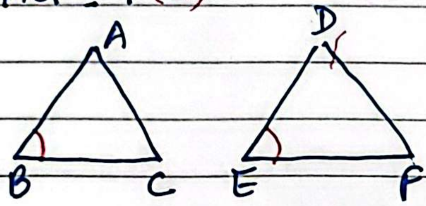
12) $8 = 2^3$

$9 = 3^2$

$25 = 5^2$

HCF = 1 (d)

13)



$\frac{AB}{DE} = \frac{BC}{EF}$

$\angle B = \angle E$ (a)

$\therefore \triangle ABC \sim \triangle DEF$ (SAS similarity)

14) P(red face card) $= \frac{6}{52} = \frac{3}{26}$ (a)

15) 2 3

P(-1, 7) A(x, y) Q(4, -3)

$A(x, y) = A\left(\frac{m_1x_2 + m_2x_1}{m_1+m_2}, \frac{m_1y_2 + m_2y_1}{m_1+m_2}\right)$

$(x, y) = \left(\frac{8-3}{5}, \frac{-6+21}{5}\right)$

$= (1, 3)$ (d)

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

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

$\frac{\sin\theta}{\cos\theta} = \frac{1}{\sqrt{3}}$

$\tan\theta = \frac{1}{\sqrt{3}}$

$\therefore \theta = 30^\circ$ (a)

17) HCF × LCM = product of numbers

$8 \times 48 = 16 \times y$

$\therefore y = \dfrac{8 \times \cancel{48}^{3}}{\cancel{16}_{1}} = 24$ (a)

18) put $x = 2$, $2 \times 4 + 2k - 6 = 0$

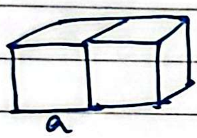
$8 + 2k - 6 = 0$

$2k + 2 = 0$

$k = \dfrac{-2}{2} = -1$

$\therefore k - 1$

$= -1 - 1 = -2$ (d)

19) 

a

$a^3 = 125$

$a = 5 \text{ cm}$

For cuboid,

$l = 2a = 10 \text{ cm}$, $b = 5 \text{ cm}$, $h = 5 \text{ cm}$

Surface area of resulting cuboid

$= 2(lb + bh + hl)$

$= 2(50 + 25 + 50)$

$= 2 \times 125 = 250 \text{ cm}^2$ (True)

$SA = 2(2n+1)a^2$

$= 2(2 \times 2 + 1) \times 25 = 2(5) \times 25 = 10 \times 25 = 250$ sq. units (True)

(a) Both A and R are correct and R is the correct explanation of A

20) original perimeter of a sector $= l + 2r$

$= \dfrac{\theta}{360^\circ} \times 2\pi r + 2r$

$R = \dfrac{r}{2}$; $\theta_1 = 2\theta$

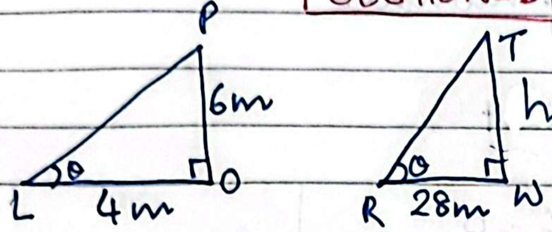
New perimeter $= \dfrac{2\theta}{360^\circ} \times 2\pi \dfrac{r}{\cancel{2}} + \cancel{2} \times \dfrac{r}{\cancel{2}_1}$

$= \dfrac{\theta}{360^\circ} \times 2\pi r + r$

Assertion is incorrect (d)

but Reason is correct.

SECTION - B

21) 

In ΔPOL and ΔTWR,

$\angle POL = \angle TWR$ (each $90°$)

$\angle PLO = \angle TRW$ (angle of elevation of sun)

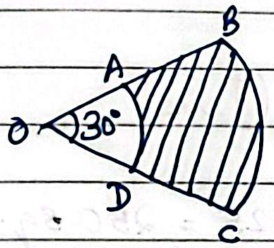
$\therefore \Delta POL \sim \Delta TWR$ (AA Similarity)

Thus, $\frac{PO}{TW} = \frac{LO}{RW}$ (corresponding sides of similar Δs are in proportion)

$\Rightarrow \frac{6}{h} = \frac{\cancel{4}^{1}}{\cancel{28}_{7}}$

$\therefore h = 6 \times 7 = 42m$

Hence, height of the tower $= 42m$ //

22) 

$r = 3.5cm$

$R = 7cm$

area of shaded region

$=$ area of outer sector $-$ area of inner sector

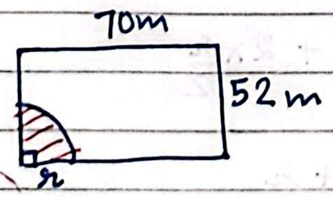
$= \frac{\theta}{360°} \times \pi R^2 - \frac{\theta}{360°} \times \pi r^2$

$= \frac{\theta}{360°}\pi(R^2 - r^2) = \frac{\cancel{30°}^{1}}{\cancel{360°}_{12\,6}} \times \frac{\cancel{22}^{11}}{7}(49 - 12.25)$

$= \frac{11}{6 \times \cancel{7}_1} \times \cancel{36.75}^{5.25}$

$= \frac{57.75}{6} = \underline{9.625 cm^2}$

OR



$r = 21m$

$\theta = 90°$

area to be grazed $=$ area of quadrent

$= \frac{1}{4}\pi r^2$

$= \frac{1}{\cancel{4}_2} \times \frac{\cancel{22}^{11}}{\cancel{7}_1} \times \cancel{21}^{3} \times 21$

$= 11 \times 1.5 \times 21 = \underline{346.5 m^2}$

23) $\tan(A+B) = \sqrt{3}$

$\therefore A+B = 60^\circ \rightarrow (1)$

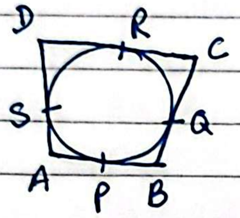
$\tan(A-B) = \frac{1}{\sqrt{3}}$

$\therefore A-B = 30^\circ \rightarrow (2)$

$(1)+(2)$, $2A = 90^\circ$

$A = 45^\circ$

$B = 15^\circ$

24) 

Given:- quadrilateral ABCD circumscribes a circle.

To prove:- $AB+CD = AD+BC$

Proof:- we know that the tangents drawn from an external point are equal in lengths,

$AP = AS$ [$\because$ A is the external point] $\rightarrow (1)$

$BP = BQ$ [$\because$ B is the external point] $\rightarrow (2)$

$CR = CQ$ [$\because$ C is the external point] $\rightarrow (3)$

$DR = DS$ [$\because$ D is the external point] $\rightarrow (4)$

$(1)+(2)+(3)+(4)$, $(AP+BP)+(CR+DR) = (AS+DS)+(BQ+CQ)$

$\Rightarrow AB+CD = AD+BC$

Hence proved.

25) Let $p(x) = x^2-7x+12$ be of the form ax^2+bx+c; where $a=1, b=-7$ and $c=12$.

$p(x) = x^2-7x+12 = x^2-4x-3x+12 = (x-4)(x-3)$

$\therefore$ The zeroes are 4 and 3

Let $\alpha = 4$ and $\beta = 3$

Sum of zeroes $= \alpha+\beta = 4+3 = 7 = \frac{-(-7)}{1} = -\frac{b}{a} = \frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$

Product of zeroes $= \alpha\beta = 4\times 3 = \frac{12}{1} = \frac{c}{a} = \frac{\text{constant term}}{\text{coefficient of } x^2}$

Hence verified

Section - C

26) Let us assume that $\sqrt{7}$ is rational.

Thus, $\sqrt{7} = \frac{a}{b}$; where a and b are co-prime integers and $b \neq 0$

$\Rightarrow \sqrt{7}b = a$

$\Rightarrow 7b^2 = a^2 \longrightarrow (1)$

$\Rightarrow$ 7 divides a^2

$\Rightarrow$ 7 divides a

Let $a = 7c$; where c is any integer.

From eq: (1), $7b^2 = 49c^2$

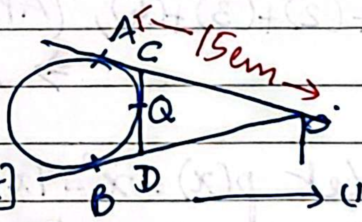
$\Rightarrow b^2 = 7c^2$

$\Rightarrow$ 7 divides b^2

$\Rightarrow$ 7 divides b

Thus, 7 is a common factor of a and b. But this contradicts the fact that a and b are co-prime integers (ie, HCF=1). This contradiction arises due to our wrong assumption that $\sqrt{7}$ is rational. Hence $\sqrt{7}$ is irrational.

27) We know that the tangents drawn from an external point are equal in lengths,



PA = PB [∵ P is the external point] $\longrightarrow (1)$

CA = CQ [∵ C is the external point] $\longrightarrow (2)$

DQ = DB [∵ D is the external point] $\longrightarrow (3)$

PA = PC + CA = PC + CQ [from eq: (2)]

PB = PD + DB = PD + DQ [from eq: (3)]

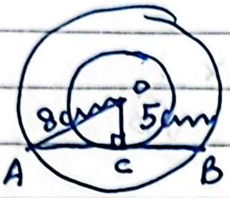
PA + PB = PC + (CQ + DQ) + PD

$\Rightarrow$ 2 PA = PC + CD + PD

$\Rightarrow$ 2 PA = Perimeter (ΔPCD)

$\therefore$ perimeter (ΔPCD) = 2 PA = $2 \times 15 = 30$ cm //

OR



To find : length of AB

$\angle OCA = 90°$ [radius OC $\perp$ tangent AB through the point of contact C]

Using pythagoras theorem in rt. $\triangle OCA$,

$AC^2 = OA^2 - OC^2 = 64 - 25 = 39$

$AC = \sqrt{39}$ ~~units~~ cm

Thus, $AB = 2AC$ [$\because$ $\perp$ drawn from the Centre bisects the chord]

$= 2\sqrt{39}$ ~~units~~ cm //

28) $a_n = a + (n-1)d$

$a_3 = a + 2d = 4 \rightarrow (1)$

$a_9 = a + 8d = -8 \rightarrow (2)$

(1) − (2), $-6d = 12$

$\boxed{d = -2}$

From eq:(1), $a = 4 + 4$

$\boxed{a = 8}$

$a_n = 0$

$\Rightarrow a + (n-1)d = 0$

$\Rightarrow 8 - 2(n-1) = 0$

$\Rightarrow -2(n-1) = -8$

$n - 1 = 4$

$n = 5$

Hence, 5^{th} term of the given AP is zero.

29) LHS, $\dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$

$\div \cos\theta \Rightarrow \dfrac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta} = \dfrac{\sec\theta + \tan\theta - 1}{\tan\theta + 1 - \sec\theta}$

$= \dfrac{(\sec\theta + \tan\theta) - (\sec^2\theta - \tan^2\theta)}{\tan\theta + 1 - \sec\theta}$

$= \dfrac{(\sec\theta + \tan\theta) - (\sec\theta + \tan\theta)(\sec\theta - \tan\theta)}{\tan\theta + 1 - \sec\theta}$

$= \dfrac{(\sec\theta + \tan\theta)\cancel{[1 - \sec\theta + \tan\theta]}}{\cancel{\tan\theta + 1 - \sec\theta}}$

$= \sec\theta + \tan\theta$, RHS

(OR) $\frac{5\tan 60^\circ}{(\sin^2 60^\circ + \cos^2 60^\circ)\tan 30^\circ} = \frac{5\sqrt{3}}{\left[\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2\right] \times \frac{1}{\sqrt{3}}}$

$= \frac{5\sqrt{3}}{\left(\frac{3}{4} + \frac{1}{4}\right) \times \frac{1}{\sqrt{3}}}$

$= \frac{5\sqrt{3}}{1 \times \frac{1}{\sqrt{3}}} = \frac{5\sqrt{3} \times \sqrt{3}}{1} = 5 \times 3$

$= 15$

30) Total no. of outcomes $= 6^2 = 36$

$P(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$

(i) favourable outcomes $= \{(1,1), (2,2), (3,3), (4,4)$
$(5,5), (6,6)\}$

$\therefore$ P(getting a doublet) $= \frac{6}{36} = \frac{1}{6}$

(ii) favourable outcomes $= \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6),$
$(2,1), (2,2), (2,3), (2,4), (2,5), (2,6),$
$(3,1), (3,2), (3,3), (3,4), (3,5),$
$(4,1), (4,2), (4,3), (4,4),$
$(5,1), (5,2), (5,3),$
$(6,1), (6,2)\}$

$\therefore$ P(getting sum <9) $= \frac{26}{36} = \frac{13}{18}$

(iii) favourable outcomes $= \{(1,1), (1,3), (1,5),$
$(2,2), (2,4), (2,6),$
$(3,1), (3,3), (3,5),$
$(4,2), (4,4), (4,6),$
$(5,1), (5,3), (5,5)$
$(6,2), (6,4), (6,6)\}$

$\therefore$ P(getting sum an even number) $= \frac{18}{36} = \frac{1}{2}$

31) $47x + 31y = 63 \rightarrow (1)$
$31x + 47y = 15 \rightarrow (2)$

$(1)+(2)$, $78x + 78y = 78$
$(\div 78) \Rightarrow x + y = 1 \rightarrow (3)$
$(1)-(2)$, $16x - 16y = 48$
$(\div 16) \Rightarrow x - y = 3 \rightarrow (4)$
$(3)+(4)$, $2x = 4$

$\boxed{x = 2 \quad y = -1}$

SECTION-D

32)

C.I	f	c.f
20-30	p	p
30-40	15	15+p
40-50	25	40+p
$\boxed{50-60}$	20	60+p
60-70	q	60+p+q
70-80	8	68+p+q
80-90	10	78+p+q

$78 + p + q = 90$
$p + q = 90 - 78$
$p + q = 12 \rightarrow (1)$
median class = 50-60
$l = 50, f = 20, c.f = 40+p$
$h = 10$

$$\text{median} = l + \frac{\frac{n}{2} - c.f}{f} \times h = 50 + \frac{45 - 40 - p}{2\cancel{0}} \times 1\cancel{0}$$

$$\Rightarrow 50 = 50 + \frac{5-p}{2}$$

$$\Rightarrow 0 = \frac{5-p}{2}$$

$\boxed{p = 5}$

$\boxed{q = 7}$

Modal class = 40-50
$l = 40, f_0 = 15, f_1 = 25, f_2 = 20$

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 40 + \frac{25-15}{50-15-20} \times 10$$

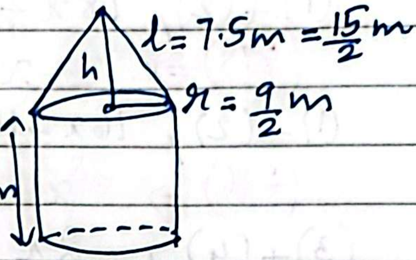
$$= 40 + \frac{100}{15}$$

$= 40 + 6.67 = \underline{\underline{46.67}}$ (approx

33) Proof of Basic Proportionality Theorem.

(with figure, Given, To prove, proof, construction etc)

34) $h = \sqrt{l^2 - r^2} = \sqrt{\left(\frac{15}{2}\right)^2 - \left(\frac{9}{2}\right)^2}$



$= \sqrt{\frac{225}{4} - \frac{81}{4}} = \sqrt{\frac{144}{4}}$

$= \frac{12}{2} = 6m$

T.S.A of rocket $= C.S.A_{cylinder} + BA_{cylinder} + C.S.A_{cone}$

$= 2\pi r H + \pi r^2 + \pi r l$

$= \pi r (2H + r + l)$

$= \frac{\cancel{22}^{11}}{7} \times \frac{9}{\cancel{2}_1}\left(30 + \frac{9}{2} + \frac{15}{2}\right)$ 25

$= \frac{11 \times 9}{7}(30 + 12) = \frac{11 \times 9}{\cancel{7}_1} \times \cancel{42}^{6}$

$= \underline{594 m^2}$

volume of rocket = volume of cone + volume of cylinder

$= \frac{1}{3}\pi r^2 h + \pi r^2 H$

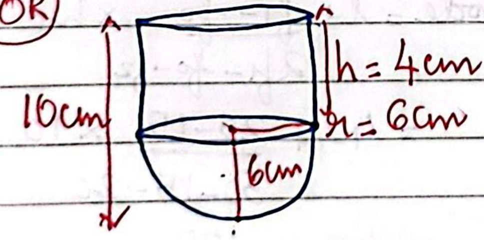
$= \pi r^2 \left(\frac{h}{3} + H\right)$

$= \frac{\cancel{22}^{11}}{7} \times \frac{9}{\cancel{2}_1} \times \frac{9}{2}\left(\frac{6}{3} + 15\right)$

$= \frac{11 \times 9 \times 9}{7 \times 2} \times 17 = \frac{\cancel{7573.5}\ \cancel{15147}}{7 \times 2 1}$ 1081.92

$= \underline{\underline{1081.92 m^3}}$

OR



Inner surface area $= C.S.A_{cylinder} + C.S.A_{hemisphere}$

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

$= 2\pi r (h + r)$

$= 2 \times \frac{22}{7} \times 6 (4 + 6) = \frac{2 \times 22 \times 6 \times 10}{7}$

$= \frac{2640}{7} = \underline{377.14 cm^2}$

Volume of the vessel = Volume of hemisphere + volume of cylinder

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

$$= \pi r^2\left(\frac{2}{3} r + h\right) = \frac{22}{7} \times 6 \times 6\left(\frac{2}{\cancel{3}_{1}} \times \cancel{6}^{2} + 4\right)$$

$$= \frac{22}{7} \times 6 \times 6 \times 8 = \frac{6336}{7} = \underline{905.14 \text{ cm}^3}$$

35) Let the usual speed of the train be x km/hr.

ATQ, $\frac{300}{x} - \frac{300}{x+5} = 2$

$$300\left[\frac{1}{x} - \frac{1}{x+5}\right] = 2$$

$$300\left[\frac{\cancel{x}+5-\cancel{x}}{x(x+5)}\right] = 2$$

$$300 \times 5 = 2x(x+5)$$

$$2x^2 + 10x - 1500 = 0$$

$$x^2 + 5x - 750 = 0$$

$$(x+30)(x-25) = 0$$

$$x = -30, 25$$

x cannot be -ve, ∴ required value of x is 25 km/hr

Hence, the usual speed of the train = 25 km/hr.

$\boxed{\text{SECTION-E}}$

36) (i) 5 units

(ii) $(-3,-3)$ ———— $C(6,-5)$

$$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

$$= \sqrt{(6+3)^2 + (-5+3)^2}$$

$$= \sqrt{9^2 + (-2)^2} = \sqrt{81+4}$$

$$= \sqrt{85} \text{ units}$$

(iii) $B(4,3)$

$$d = \sqrt{x^2+y^2} = \sqrt{16+9} = \sqrt{25} = 5 \text{ units}$$

(iv) $A(-5,2)$, $D(-3,-3)$, $E(1,1)$

$$AD = \sqrt{(-3+5)^2 + (-3-2)^2} = \sqrt{4+25} = \sqrt{29} \text{ units}$$

$$AE = \sqrt{(1+5)^2 + (1-2)^2} = \sqrt{36+1} = \sqrt{37} \text{ units}$$

$\therefore$ A is not equidistant from D and E

37) $S_n = 120$

$a_1 = 3$

$a_2 = 5$

$a_3 = 7$

$a_2 - a_1 = 2$

$a_3 - a_2 = 2$

Thus, the arrangement of candies forms an AP with $a = 3$ and $d = 2$.

1) 2

2) $a_7 = a + 6d = 3 + 6 \times 2 = 3 + 12 = 15$ candies

3) $S_n = \frac{n}{2}[2a + (n-1)d]$

$\Rightarrow 120 = \frac{n}{2}[6 + (n-1)2]$

$\Rightarrow 240 = n[6 + 2n - 2]$

$\Rightarrow 240 = n[4 + 2n]$

$\Rightarrow \cancel{240}^{120} = \cancel{2}n[2+n]$

$\Rightarrow 120 = 2n + n^2$

$\Rightarrow n^2 + 2n - 120 = 0$

$(n+12)(n-10) = 0$

$n = -12, 10$

n cannot be -ve, $\therefore$ required value of n is 10

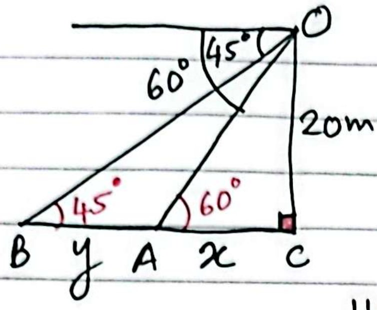
Hence, there are 10 rows of candies

OR $a_9 = a + 8d = 3 + 16 = 19$

$a_4 = a + 3d = 3 + 6 = 9$

$\therefore$ the difference $= 19 - 9 = \underline{10}$

38) (i)



In rt. ΔOAC,

$\tan 60° = \frac{OC}{AC}$

$\Rightarrow \sqrt{3} = \frac{20}{x}$

$\Rightarrow x = \frac{20}{\sqrt{3}} = \frac{20\sqrt{3}}{3}$ m

Hence the ship is $\frac{20\sqrt{3}}{3}$ m away from the observer.

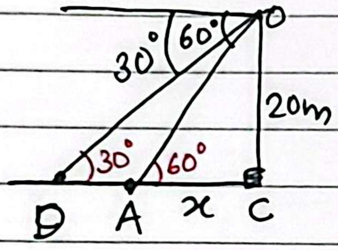
(ii) In rt. ΔOCB, $\tan 45° = \frac{OC}{BC}$

$\Rightarrow 1 = \frac{20}{BC}$

$\Rightarrow BC = 20$ m

Hence, the ship is 20m away from the observer.

(iii)



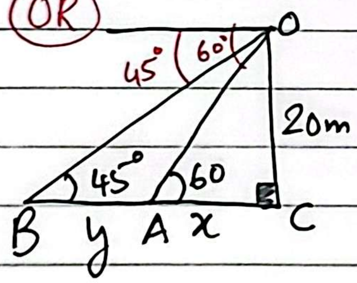
In rt. ΔCOD, $\tan 30° = \frac{OC}{DC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{20}{DC}$

$\Rightarrow DC = 20\sqrt{3}$ m

Hence, the ship is $20\sqrt{3}$ m away from the observer.

OR



$x = \frac{20\sqrt{3}}{3}$ m

$\tan 45° = \frac{OC}{BC}$

$\Rightarrow 1 = \frac{20}{x+y}$

$\Rightarrow x + y = 20$

$\Rightarrow \frac{20\sqrt{3}}{3} + y = 20$

$y = 20 - \frac{20\sqrt{3}}{3}$

$y = 20\left(1 - \frac{\sqrt{3}}{3}\right)$

$\therefore y = \frac{20(3-\sqrt{3})}{3}$ m

Hence, the distance between the ships is $\frac{20(3-\sqrt{3})}{3}$ m