KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS HYD – 32
REVISION TEST - 05 FOR CLASS X BOARD EXAM 2021
SAMPLE ANSWERS

Max. marks: 60 **Time Allowed: 2 hrs**

SECTION – A (1 MARK EACH)

1. Find after how many places of decimal the decimal form of the $\frac{27}{2^3.5^4.3^2}$ number will terminate.

$\frac{27}{2^3.5^4.3^2}$

$= \frac{3^3}{2^3.5^4.3^2}$

$= \frac{3}{2^3.5^4}$

Now power of 5 is 4 and that of 2 is 3

$\therefore$ 4 > 3, so the decimal will terminate after 4 places

2. Given that ΔABC ~ ΔPQR. $\frac{AB}{PQ} = \frac{1}{3}$ then find $\frac{ar(\Delta ABC)}{ar(\Delta PQR)}$

Given that ΔABC ~ ΔPQR

$\frac{AB}{PQ} = \frac{1}{3}$

Using theorem "If two triangles are similar then the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

$\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \left(\frac{AB}{PQ}\right)^2$

$\therefore \frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \left(\frac{1}{3}\right)^2$

$\therefore \frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{1}{9}$

3. Find the distance of point P(x, y) from the origin.

According to the question,

Origin O (0,0) and point P (x, y)

Distance of a point P(x, y) from O (0, 0) = $OP = \sqrt{(x-0)^2(y-0)^2} = \sqrt{x^2+y^2}$ units

4. Write the discriminant of the quadratic equation $(x + 5)^2 = 2 (5x – 3)$.

$(x+5)^2 = 2(5x-3)$

$\therefore x^2 + 10x + 25 = 10x - 6$

$\therefore x^2 + 31 = 0$

discriminat $= b^2 - 4ac$

$\therefore b^2 - 4ac = 0^2 - 4(1)(31) = -124$

5. If 2 is a zero of a polynomial p(x) = kx2 + (3k – 2)x + k, then find the value of k.

Since 2 is a zero of $p(x) = kx^2 + (3k-2)\,x + k$,

$\therefore \quad p(2) = 0$

$\Rightarrow k(2)^2 + (3k-2)\,(2) + k = 0$

$\Rightarrow 4k + 6k - 4 + k = 0$

$\Rightarrow 11k - 4 = 0$. Hence, $k = \frac{4}{11}$.

6. Find the sum of the first 10 multiples of 3.
The multiples of 3 are
3, 6, 9, 12…
The above series is in arithmetic progression
∴ a = 3 and d = 3
We need sum of 10 multiples

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

$$\therefore S_{10} = \frac{10}{2}(2 \times 3 + (10-1)3)$$

$$\therefore S_{10} = 165$$

7. If x = 3 is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k.
Let $p(x) = x^2 - 2kx - 6$
x = 3 is one root of given quadratic equation.
∴ p (3) = 0
∴ $3^2 - 2k \times 3 - 6 = 0$
∴ 9 - 6k - 6 = 0
∴ 3 = 6k
$\therefore k = \frac{1}{2}$

8. If $\tan \alpha = \frac{5}{12}$, find the value of sec α.
Given:
$\tan \alpha = \frac{5}{12}$
we know,
$\sec^2 \alpha = 1 + \tan^2 \alpha$

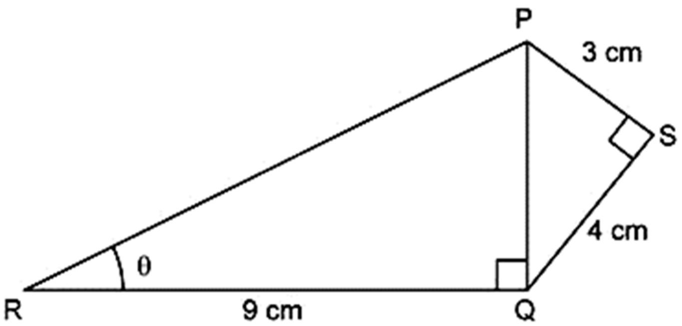
$$\sec \alpha = \sqrt{1 + \left(\frac{5}{12}\right)^2}$$

$$\sec \alpha = \sqrt{\frac{144+25}{144}} = \sqrt{\frac{169}{144}} = \frac{13}{12}$$

$$\sec \alpha = \frac{13}{12}$$

SECTION – B (2 MARKS EACH)

9. In the below figure, PS = 3 cm. QS = 4 cm, ∠PRQ = θ, ∠PSQ = 90°, ∠PQ ⊥ RQ and RQ = 9 cm. Evaluate tan θ.



In the figure we have a right angled triangle ΔPSQ
So on applying Pythagoras theorem we get
∴ $PQ^2 = PS^2 + QS^2$

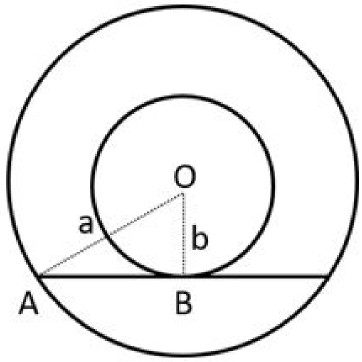
$$\therefore PQ = \sqrt{3^2 + 4^2}$$
$$= \sqrt{25}$$
$$= 5$$

In ΔPQR

$\therefore \tan\theta = \frac{PQ}{QR}$

$\therefore \tan\theta = \frac{5}{9}$

10. Two concentric circles of radii a and b (a > b) are given. Find the length of the chord of the larger circle which touches the smaller circle.



It is given that a > b,
AB is the tangent to the smaller circle,
OB $\perp$ AB…..(tangent $\perp$ radius)
So ΔABO is right angled triangle
$\therefore AO^2 = AB^2 + BO^2$
$\therefore AB = \sqrt{a^2 - b^2}$

Now we know that the perpendicular drawn from the center to a chord bisects the chord so
The length of chord will be 2AB = $2\sqrt{a^2 - b^2}$

11. Find the value(s) of x, if the distance between the point A(0,0) and B(x, -4) is 5 units.

A(0, 0) and B(x, -4)
The distance AB is given by distance formula
$AB = \sqrt{(x-0)^2 + (-4-0)^2}$
$AB = \sqrt{x^2 + 16}$
Now,
AB = 5 Units
$\therefore 5 = \sqrt{x^2 + 16}$
squaring
$\therefore 25 = x^2 + 16$
$\therefore x^2 = 9$
$\therefore x = \pm 3$

12. Solve the following pair of linear equations:

3x + 4y = 10
2x – 2y = 2

3x + 4y = 10 …. (i)
2x – 2y = 2 …. (ii)
Multiply equation (ii) by 2, we get
4x – 4y = 4 …. (iii)
Adding equation (i) and (iii), we get
$\therefore$ 7x = 14
$\Rightarrow$ x = 2
Put x = 2 in the equation (ii), we get
$\therefore$ 2(2) – 2y = 2
$\Rightarrow$ 2y = 4 – 2
$\Rightarrow$ y = 2/2 = 1
Hence the solutions is x = 2 and y = 1.

13. On a morning walk, three persons step out together and their steps measure 30 cm, 36 cm and 40 cm respectively. When is the minimum distance each should walk so that each can cover the same distance in complete steps?

We have to find the LCM of 30 cm, 36 cm and 40 cm to get the required minimum distance. Because we are asked the minimum distance

Now, $30 = 3 \times 2 \times 5$,

$36 = 2 \times 3 \times 2 \times 3$

$40 = 2 \times 2 \times 2 \times 5$

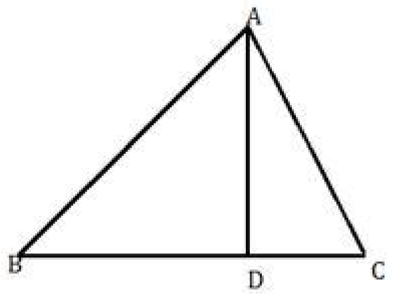
$\therefore$ LCM (30, 36, 40) = $2^3 \times 3^2 \times 5 = 360$

Minimum distance each should walk 360 cm. so that, each can cover the same distance in complete steps.

SECTION – C (3 MARKS EACH)

14. The perpendicular from A on side BC of a ΔABC meets BC at D such that DB = 3CD. Prove that $2AB^2 = 2AC^2 + BC^2$.

Given that in ΔABC, we have



$AD \perp BC$ and BD = 3CD

Now, using Pythagoras theorem in right angle triangles ADB and ADC, we have

$AB^2 = AD^2 + BD^2$ ...(i)

$AC^2 = AD^2 + DC^2$ ...(ii)

Subtracting equation (ii) from equation (i), we get

$AB^2 - AC^2 = BD^2 - DC^2$

$= (3CD)^2 - DC^2$

$= 9\,DC^2 - DC^2$

$= 8\,DC^2$

Since, $BC = BD + DC$

$\Rightarrow BC = 3DC + DC$

$\Rightarrow BC = 4DC$

$\Rightarrow DC = \frac{BC}{4}$

Then, we have

$AB^2 - AC^2 = 8\left(\frac{BC}{4}\right)^2$

$\Rightarrow AB^2 - AC^2 = \frac{BC^2}{2}$

$\Rightarrow 2AB^2 - 2AC^2 = BC^2$

$\Rightarrow 2AB^2 = 2AC^2 + BC^2$

Hence, proved.

15. Find the largest number which on dividing 1251, 9377 and 15628 leaves remainders 1, 2 and 3 respectively.

Let the largest number which divides the given numbers be x.

Since, it leaves the remainders 1, 2 and 3 while dividing 1251, 9377 and 15628

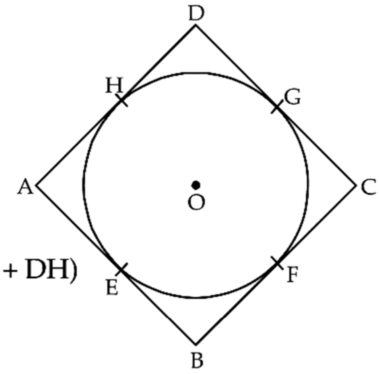
So, the numbers which are divisible by x are:

1251 – 1 =1250, 9377 – 2 =9375 and 15628 – 3 = 15625

Here, x is the largest number dividing these 3 numbers so x becomes the GCD or HCF

Now, $1250 = 5^4 \times 2$
$9375 = 5^5 \times 3$ and $15625 = 5^6$
Therefore x = HCF (1250, 9375, 15625) = $5^4 = 625$.
Hence, the required number is 625.

16. Prove that the parallelogram circumscribing a circle is a rhombus.



Here B is an external point,

$\therefore \quad BE = BF \quad ...(1)$

Similarly, $AE = AH \quad ...(2)$

$CG = CF \quad ...(3)$

and $DG = DH \quad ...(4)$

Adding (1), (2), (3) and (4), we get:

$(BE + AE) + (CG + DG) = (BF + CF) + (AH + DH)$

$\Rightarrow AB + CD = BC + AD \quad ...(5)$

Since ABCD is a parallelogram,

$\therefore \quad AB = CD$ and $BC = AD \quad ...(6)$

From (5) and (6),

$AB + AB = BC + BC$

$\Rightarrow 2AB = 2BC$

$\Rightarrow AB = BC.$

Thus, $AB = BC = CD = AD$.

Hence, ABCD is a rhombus.

17. If sin (A – B) = 1/2 , cos (A + B) = 1/2 , 0° < A + B ≤ 90°, A > B, find A and B.

We have: $\sin(A - B) = \frac{1}{2}$ and $\cos(A + B) = \frac{1}{2}$

$\Rightarrow \sin(A - B) = \sin 30°$

and $\cos(A + B) = \cos 60°$

$\Rightarrow A - B = 30° \quad ...(1)$

and $A + B = 60° \quad ...(2)$

Adding (1) and (2),

$(A - B) + (A + B) = 30° + 60°$

$\Rightarrow 2A = 90°$

$\Rightarrow A = 45°.$

Puting $A = 45°$ in (1), we get:

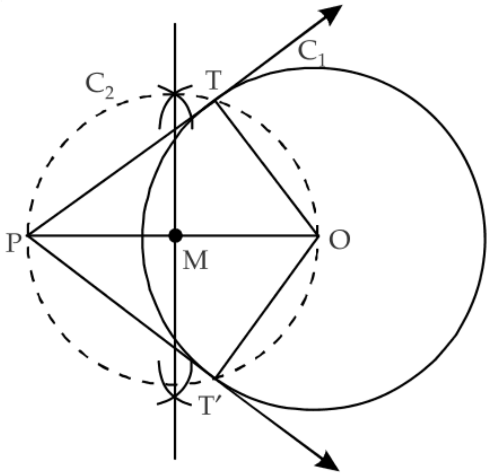
$\Rightarrow 45° - B = 30°$

$\Rightarrow B = 45° - 30° = 15°.$

Hence, $A = 45°$ and $B = 15°$.

18. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

Correct Construction with steps of constructions:



19. Prove that: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

LHS $= (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= (\sin^2 A + \operatorname{cosec}^2 A + 2 \sin A \operatorname{cosec} A)$

$\quad + (\cos^2 A + \sec^2 A + 2 \cos A \sec A)$

$= \left[\sin^2 A + (1+\cot^2 A) + 2 \sin A \left(\frac{1}{\sin A}\right)\right] +$

$\left[\cos^2 A + (1+\tan^2 A) + 2 \cos A \left(\frac{1}{\cos A}\right)\right]$

$= \sin^2 A + 1 + \cot^2 A + 2 + \cos^2 A + 1 + \tan^2 A + 2$

$= (\sin^2 A + \cos^2 A) + 6 + (\tan^2 A + \cot^2 A)$

$= 1 + 6 + \tan^2 A + \cot^2 A$

$= 7 + \tan^2 A + \cot^2 A =$ **RHS.**

20. Solve for x and y: $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2; \qquad \frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$

The given pair of equations can be written as:

$$2\left(\frac{1}{\sqrt{x}}\right) + 3\left(\frac{1}{\sqrt{y}}\right) = 2 \qquad ...(1)$$

and $$4\left(\frac{1}{\sqrt{x}}\right) - 9\left(\frac{1}{\sqrt{y}}\right) = -1 \qquad ...(2)$$

Putting $\frac{1}{\sqrt{x}} = p$ and $\frac{1}{\sqrt{y}} = q$, we get:

$$2p + 3q = 2 \qquad ...(3)$$

and $$4p - 9q = -1 \qquad ...(4)$$

Multiplying (3) by 3,

$$6p + 9q = 6 \qquad ...(5)$$

Adding (4) and (5),

$$10p = 5 \qquad ...(6)$$

$\Rightarrow \quad p = \frac{1}{2}.$

Putting $p = \frac{1}{2}$ in (3), $2\left(\frac{1}{2}\right) + 3q = 2$

$\Rightarrow 3q = 2 - 1 = 1 \quad \Rightarrow q = \frac{1}{3}.$

Thus $\frac{1}{\sqrt{x}} = \frac{1}{2}$ and $\frac{1}{\sqrt{y}} = \frac{1}{3}$

$\Rightarrow \sqrt{x} = 2$ and $\sqrt{y} = 3$.

Hence, $x = 4$ and $y = 9$.

21. If 2/3 and -3 are the zeroes of the polynomial $ax^2 + 7x + b$, then find the values of a and b.

Given polynomial is $p(x) = ax^2 + 7x + b$

$\frac{2}{3}$ and -3 are the zeroes of p(x)

$\Rightarrow p\left(\frac{2}{3}\right) = 0$ and $p(-3) = 0$

$\Rightarrow a\left(\frac{2}{3}\right)^2 + 7\left(\frac{2}{3}\right) + b = 0$

$\Rightarrow \frac{4a}{9} + \frac{14}{3} + b = 0$

$\Rightarrow 4a + 9b + 42 = 0$ ...(i)

Also, $a(-3)^2 + 7(-3) + b = 0$

$\Rightarrow 9a + b - 21 = 0$ ...(ii)

Solving (i) and (ii) simultaneously, we get

a = 3

Substituting the value of a in (ii), we get

b = -6

SECTION – D (5 MARKS EACH)

22. A motorboat whose speed in still water is 9 km/h, goes 15 km downstream and comes to the same spot, in a total time of 3 hours 45 minutes. Find the speed of the stream.

Let T be the time for downstream and t be the time for upstream, travel.
T + t = 3 hrs 45 min = 15/4 hrs ….(i)
For downstream, distance/velocity = time

$\therefore \frac{15}{V+v} = T$ where V is the speed of boat and v is the speed of stream.

$\therefore \frac{15}{9+v} = T$ ...(ii)

Similarly,

$\therefore \frac{15}{9+v} = t$ ...(iii)

Additing (ii) and (iii)

$\therefore \frac{15}{9+v} + \frac{15}{9-v} = T + t$

$\therefore 15\left(\frac{9-v+9+v}{(9+v)(9-v)}\right) = \frac{15}{4}$ from(i)

$\therefore \frac{15\times 18}{81-v^2} = \frac{15}{4}$

$\therefore \frac{18}{81-v^2} = \frac{1}{4}$

$\therefore 81 - v^2 = 72$

$\therefore v^2 = 9$

$\therefore v = 3 \text{ km/hr}$

Hence, the speed of the stream is 3 km/hr.

OR

A plane left 30 minute late than its scheduled time and in order to reach the destination 1500 km away in time it had to increase its speed by 100 km/h from the usual speed. Find its usual speed.

Here,
Distance =1500km
As we know,

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

Let the usual speed of plane be x km/hr.

$\therefore T_1 = \frac{1500}{x}\text{hr}$

After increasing the speed by 100 km/hr it's speed becomes (x+100) km/hr.

$\therefore T_2 = \frac{1500}{x+100}\text{hr}$

Given that difference in speed is 30 mins which is $\frac{1}{2}$ hours

$\therefore T_1 - T_2 = \frac{1}{2}$

$\therefore \frac{1500}{x} - \frac{1500}{x+100} = \frac{1}{2}$

$\therefore \frac{1500(x+100) - 1500x}{x(x+100)} = \frac{1}{2}$

$\therefore x^2 + 100x - 300000 = 0$
$\therefore x^2 + 600x - 500x - 300000 = 0$
$\therefore (x + 600)(x - 500) = 0$
$\therefore x = -600$ or $x = 500$
Speed can’t be negative
$\therefore x = 500$ km/hr
Therefore, the usual speed of plane is 500km/hr.

23. If m times the m^{th} term of an Arithmetic Progression is equal to n times its n^{th} term and $m \neq n$, show that the $(m + n)^{th}$ term of the A.P. is zero.

Let the m^{th} term of an Arithmetic Progression be a_m and n^{th} term be a_n.

Also, a and d be the first term and common difference respectively.

According to the question,

$ma_m = na_n$

$\therefore m[a + (m - 1)d] = n[a + (n - 1)d]$

$\therefore am + m^2d - md = an + n^2d - nd = 0$

$\therefore a(m - n) + (m^2 - n^2)d - (m - n)d = 0$

$\therefore a(m - n) + (m + n)(m - n)d - (m - n)d = 0$

$\therefore (m - n)[a + (m + n)d - d] = 0$

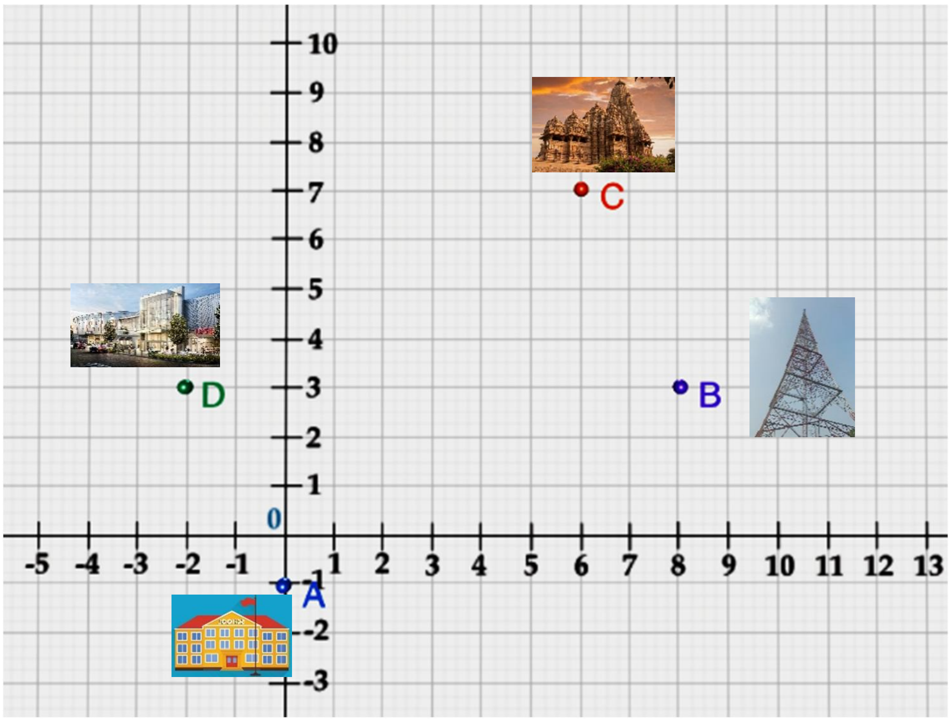
It is given that $m \neq n$.

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

$\therefore a_{m+n} = 0$

CASE STUDY-BASED QUESTIONS (Each sub-question carries 1 mark)

24. One day Ram went to his home town during Dussehra vacation. During his excursion, he noted the four places Temple, TV tower, Mall and School, then he tried to locate all the places using graph sheet by taking his position at origin. He marked A, B, C and D for School, TV Tower, Temple and Mall respectively on the graph sheet by taking scale as 1 unit = 1 km as shown below.



Based on the above information, answer the following questions: (Attempt any four)

(i) Find the coordinates of A, B, C and D.
A(0, -1), B(8, 3), C(6, 7) and D(-2, 3)

(ii) Find the distance between School and TV Tower.

$$AB = \sqrt{(8-0)^2 + (3+1)^2}$$
$$= \sqrt{64+16} = \sqrt{80} = 4\sqrt{5} \text{ km}$$

(iii) Find the distance between TV tower and Mall.

BD = 10 km

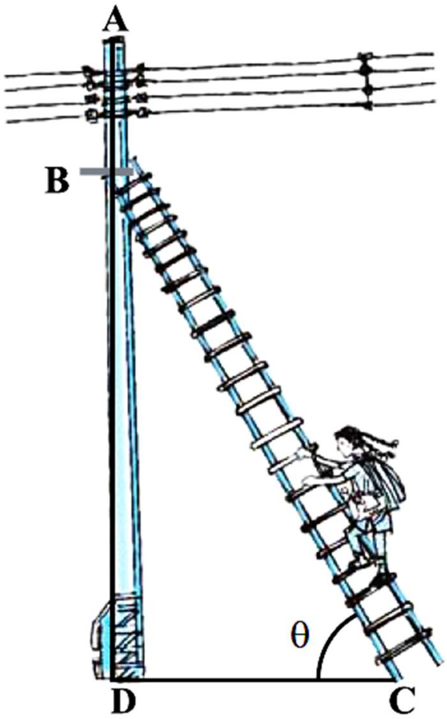
(iv) Find the distance between School and Temple.

$$AC = \sqrt{(6-0)^2 + (7+1)^2}$$
$$= \sqrt{36+64}$$
$$= \sqrt{100} = 10 \text{ km}$$

(v) Name the quadrilateral ABCD so formed.

Rectangle

25. In a village, group of people complained for an electric fault in their area. On their complained, an electrician reached village to repair an electric fault on a pole of height 5 m. She needs to reach a point 1.3m below the top of the pole to undertake the repair work (see the below figure). She used ladder, inclined at an angle of θ to the horizontal such that cos θ = 0.5, to reach the required position.



Based on the above information, answer the following questions: (Attempt any four)

(i) Find the angle of elevation θ.

$\cos\theta = 0.5 = \cos 60^0 \Rightarrow \theta = 60^0$

(ii) Find the length BD.

BD = AD – AB = (5 – 1.3)m = 3.7 m.

(iii) Find the length of the ladder. (You may take $\sqrt{3} = 1.73$)

$$\frac{BD}{BC} = \sin 60^\circ \text{ or } \frac{3.7}{BC} = \frac{\sqrt{3}}{2}$$

$$BC = \frac{3.7 \times 2}{\sqrt{3}} = 4.28 \text{ m (approx.)}$$

Hence, the length of the ladder should be 4.28 m.

(iv) How far from the foot of the pole should she place the foot of the ladder?

$$\frac{DC}{BD} = \cot 60° = \frac{1}{\sqrt{3}}$$

$$DC = \frac{3.7}{\sqrt{3}} = 2.14 \text{ m (approx.)}$$

Therefore, she should place the foot of the ladder at a distance of 2.14 m from the pole.

(v) If the height of pole and distance BD is doubled, then what will be the length of the ladder.

$$\frac{BD}{BC} = \sin 60° \text{ or } \frac{7.4}{BC} = \frac{\sqrt{3}}{2}$$

$$BC = \frac{7.4 \times 2}{\sqrt{3}} = 8.56 \text{ m (approx.)}$$

Hence, the length of the ladder will be 8.56 m.