

### CDC 08 2022 QA

Scorecard (procreview.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:49:35 IST 2023&qsetId=wl amMJA7ks=&qsetName=CDC 08 2022 QA)

Accuracy (AccSelectGraph.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:49:35 IST 2023&qsetId=wI amMJA7ks=&qsetName=CDC 08 2022 QA)

Qs Analysis (QsAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:49:35 IST 2023&qsetId=wI amMJA7ks=&qsetName=CDC 08 2022 QA)

Video Attempt / Solution (VideoAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:49:35 IST 2023&qsetId=wl amMJA7ks=&qsetName=CDC 08 2022 QA)

Solutions (Solution.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:49:35 IST 2023&qsetId=wI amMJA7ks=&qsetName=CDC 08 2022 QA)

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Section-1

## Sec 1

Q.1 [11831809] What is the value of A such that the sum of the squares of the roots of the quadratic equation $x^2 + (4 - A)x + 3 - A = 0$ has the least value?
1 🔾 10
2○3
3 ○ 2
4 🔾 16/3

### **Correct Answer: 2**

Answer key/Solution

Let m and n be the roots of the quadratic equation  $x^2 + (4 - A)x + 3 - A = 0$ .

Then, m + n = -(4 - A) and mn = 3 - A

$$m^2 + n^2 = (m+n)^2 - 2mn = (4-A)^2 - 2(3-A)$$

$$=16+A^2-8A-6+2A$$

$$=(A-3)^2+1$$

Hence, for the minimum value of sum of the square of the roots, the value of A will be 3.

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## Q.2 [11831809]

A vessel had 320 ml of a mixture of milk and water. The mixture has 40% milk. First X ml of milk was added to the mixture. Then Y ml of water was added to the mixture. Each time an addition is done, the ratio of milk and water in the vessel is reversed. Find the difference between the quantities X and Y (in ml).

### Solution:

**Correct Answer: 80** 

Answer key/Solution

The mixture of 320 ml has  $0.4 \times 320 = 128$  ml milk and 192 ml water. Initial ratio of milk and water = 2:3.

Given that X ml of milk is added first and Y ml of water is added next.

After first addition : (128 + X) : 192 = 3 : 2 ⇒ X = 160 ml

After second addition : (128 + 160) : (192 + Y) = 2 : 3 ⇒ Y = 240 ml

Hence, required difference = 240 - 160 = 80 ml.

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## Q.3 [11831809]

Let numbers 'a' and 'b' be selected from sets S1 =  $\{11, 13, 15, 17, 19\}$  and S2 =  $\{1999, 2000, ..., 2018\}$  respectively. A new set S is created which contains the elements of the form  $a^b$  and have unit digit as 1. How many elements does S contain?

1 0 40

2 🔾 36

3 🔾 32

4 🔾 39

**Correct Answer: 1** 

Answer key/Solution

For '11', every power from 1999 to 2018 will give a unit digit of 1.

Hence, 20 such numbers will be possible.

For '13', the cyclicity is 3, 9, 7, and 1.

Therefore, whenever power is multiple of 4, i.e., 2000, 2004, 2008, 2012, 2016, the unit digit will be 1.

Hence, 5 such numbers are possible.

For '15', no number is possible. Since the unit digit will always be '5'.

For '17', it will be similar as for '13'. Hence, 5 numbers will be possible.

For '19', the cyclicity of the unit digit is 9, and 1. So when power is even, the unit digit will be 1.

Therefore, 10 such numbers will be possible.

Hence, S will contain 40 elements.

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# Q.4 [11831809]

Three friends A, B and C start simultaneously from city P to city Q. A rides the bike. The speed of the bike is 32 km/h and the walking speed of both B and C is 8 km/h. The distance between P and Q was 140 km. First A and B go together on the bike, A drops B on the way, goes back to pick up C who was walking towards Q and reach Q on the bike. After getting dropped, B walked towards Q and reached Q at the same time as A,C. Find the total distance (in km) covered by the bike.

1 140

2 0 160

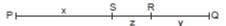
3 🔾 260

4 🔾 320

### Solution:

**Correct Answer: 3** 

Answer key/Solution



Suppose A left B at place R and he catches C at place S.

Then, time taken by bike from P to Q = Time taken by B and C by walking from P to S and R to Q – Time taken by bike from R to S

$$(x + z + 2z + y)/32 = (x + y)/8 - z/32$$

$$\Rightarrow$$
 (140 + 2z)/32 = (140 - z)/8 - z/32

$$\Rightarrow$$
 140 + 2z = 560 - 5z

$$\Rightarrow$$
 7z = 420

$$\Rightarrow$$
 z = 60 km

Hence, the total distance travelled by bike =  $140 + 2 \times 60 = 260$  km.

Bookmark

A farmer wants to fence his rectangular field to protect his crops from animals. The Rs. 300 per meter on one side, and Rs. 150 per meter along three other sides. If the is 1350 sq. m, then what is the lowest possible cost (in Rs.) of fencing the field?	
1 🔾 13500	
2 🔾 24000	
3 🔾 29000	
4 🔾 27000	
Solution:  Correct Answer : 4  Let the length be x and breadth be y.  Then, the area of the field = $xy = 1350$ (i)  Then, the cost of fencing the field = $300x + 150x + 150y + 150y$ = $450x + 300y$ (ii)  Since $AM \ge GM$ So, $(450x + 300y)/2 \ge \sqrt{(450x \times 300y)}$ fencing  Or, $450x + 300y \ge 2\sqrt{(450 \times 300 \times 1350)}$ Or, $450x + 300y \ge 2\sqrt{000}$ Hence, the lowest possible cost is Rs.27,000.  Bookmark  FeedBack	♣ Answer key/Solution
Q.6 [11831809]	

Q.5 [11831809]

Every week Binu pays for a movie ticket and a book out of her allowance. Last week, Binu's allowance was Rs. A. The cost of her movie ticket was 20% of the difference between A and the cost of the book, while the cost of her book was 5% of the difference between A and the cost of her movie ticket. To the nearest whole percent, what percentage of A did Binu pay for her movie ticket and book?

1 023%			
2 🔾 27%			
3 🔾 19%			
4 🔾 22%			

**Correct Answer: 1** 

Answer key/Solution

Answer key/Solution

Let the cost of movie ticket and book be 'a' and 'b' respectively. Then,  $a=20\%(A-b)=(A-b)\times0.2$   $b=5\%(A-a)=(A-a)\times0.05$  To find (a+b)/A, find both 'a' and 'b' in terms of A. a=0.19A/0.99 and b=0.04A/0.99 Hence,  $a+b/A\times100=23.23\%\approx23\%$ .

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## Q.7 [11831809]

Sundarpur and Pritampur are 2 stations. A single track runs between them. Train A leaves everyday from Sundarpur at 8:00 AM and reaches Pritampur. Another train B starts from Pritampur as soon as A reaches there. B reaches Sundarpur at 10:00 AM. The speed of B is four times that of A. One day, A started from Sundarpur 20 minutes late as per the schedule. In order to maintain B's right arrival time at Sundarpur, both trains travel at an increased speed. If B doubles its speed, find the ratio of the new speeds of A and B.

1 03:22		
2 0 22 : 3		
3 🔾 38 : 3		
4 🔾 44 : 9		

Solution:

**Correct Answer: 1** 

According to the question,

Normal speeds of A and B = 1:4

Normal travel time of B =  $1/5 \times 120 = 24$  minutes

New starting time of A = 8:20 AM

New total travel time of A and B = 100 minutes

As B doubles its speed, it will reach Sundarpur in 12 minutes.

So travel time of A = 88 minutes

Ratio of time taken by A and B = 88:12

Hence, ratio of speeds of A and B = 12:88 = 3:22.

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### Q.8 [11831809]

The cost of bars of a precious metal varies directly as the square of the weight of the bar. Metal bars of weights in the ratio 3:5:7 were bought from three different places and melted together to form a big bar. The cost of the big bar was Rs.69,580 more than the total cost of the metal bars. What was the difference (in Rs.) between the initial cost of the heaviest bar and the lightest bar?

Solution:	
4 🔾 24,010	
3 🔾 14,400	
2 0 19,600	
1 13,750	

**Correct Answer: 2** 

Answer key/Solution

Let the weights of the three bars be 3x, 5x and 7x.

Then, the weight of the big bar that is obtained after the melting is 3x + 5x + 7x = 15x

Sum of the costs of three bars (take the constant of popularity as 1) =  $(3x)^2 + (5x)^2 + (7x)^2 = 83x^2$ .

The cost of the big bar obtained =  $(15x)^2 = 225x^2$ 

Increase in worth =  $225x^2 - 83x^2 = 142x^2 = Rs.69.580 \Rightarrow x^2 = 490$ 

The cost of the lightest bar =  $(3x)^2 = 9x^2 = Rs. 4,410$ .

The cost of the heaviest bar =  $(7x)^2$  =  $49x^2$  = Rs. 24,010.

Hence, required difference = 24010 - 4410 = Rs.19,600.

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### Q.9 [11831809]

A set of 6 integers has to be formed from the numbers among 1, 2, 3, 4, ..., 12 with the property that no number is a multiple of another in this set. Then what is the difference of the least and the highest possible value of the numbers from all possible 6 integer sets?

## Solution:

**Correct Answer: 8** 

Answer key/Solution

If 1 is taken as the smallest value, then nothing else can be included, so that won't work.

If 2 is taken as the smallest value, every odd number except 1 has to be included, but then 3 and 9 would violate the rule, so that won't work.

With 3, numbers 1, 2, 6, 9 and 12 cannot be included. 7 and 11 must be included and one out of 4 or 8 and one out of 5 or 10 has to be included but then 6 integers cannot be selected.

Finally, starting with 4, we find that the sequence is 4, 5, 6, 7, 9, and 11. Similarly, 7, 8, 9, 10, 11, 12 sequence is possible.

Hence, maximum difference = 12 - 4 = 8.

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Q.10 [11831809] An ice cream vendor sells ice creams for Rs. 5 and Rs. 7. The vendor sold 'a' Rs. 5 i creams costing Rs. 420 on a Sunday evening. If 'a' and 'b' are natural numbers, ther possible?	
1 🔾 10	
2 🔾 11	
3 🔾 9	
4 🔾 13	
Solution: Correct Answer: 2 5a + 7b = 420, where a, b are natural numbers. So, at least 1 ice cream of Rs. 5 and 1 ice cream of Rs. 7 should have been sold. The possible pairs of (a, b) are: (77, 5), (70, 10), (63, 15), (56, 20), (49, 25), (42, 30), (14, 50), (7, 55) Hence, 11 pairs are possible.  Bookmark  FeedBack	Q. Answer key/Solution         D), (35, 35), (28, 40), (21, 45),
Q.11 [11831809] Anu takes 5 days to complete a job. Binu takes twice the time as Anu to complete the time as Binu to complete the job. Dinu takes twice the time as Chinu to complete the working together take 25% of the time to complete the job that the other two would the faster pair.  1 Anu, Dinu	ne job. Two of the four when
2 O Anu, Chinu	
3 O Anu, Binu	
4 O Chinu, Dinu	

**Correct Answer: 3** 

Answer key/Solution

Answer key/Solution

Time taken by Anu, Binu, Chinu and Dinu to complete the job is 5 days, 10 days,

20 days and 40 days respectively.

Let the total work be 40 units. Anu, Binu, Chinu and Dinu respectively can do 8, 4, 2 and 1 units of work per day.

Let us check each option:

Anu and Dinu can complete the work in 40/9 days whereas Chinu and Binu can do it in 40/6 days.

Anu and Chinu can complete the work in 40/10 = 4 days whereas Dinu and Binu can do it in 40/5 = 8 days.

Anu and Binu can complete the work in 40/12 days whereas Chinu and Dinu can do it in 40/3 days.

Chinu and Dinu can complete the work in 40/3 days whereas Anu and Binu can do it in 40/12 days.

Hence, option (3) satisfies the given condition.

The time taken by Anu and Binu as a percentage of the time taken by Chinu and Dinu =  $(40/12)/(40/3) \times 100 = 25\%$ .

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## Q.12 [11831809]

For a positive integer n,  $(\sqrt{2})^{\frac{4}{5}}(\sqrt{2})^{\frac{8}{5}}...(\sqrt{2})^{\frac{2^{n+1}}{5}} > 63$ , then what is the least possible value of 'n'?

### Solution:

**Correct Answer: 4** 

$$(\sqrt{2})^{\frac{4}{5}}(\sqrt{2})^{\frac{8}{5}}...(\sqrt{2})^{\frac{2^{n+1}}{5}}$$

$$= 2^{\frac{2}{5}} \times 2^{\frac{4}{5}} \times 2^{\frac{8}{5}} \dots \times 2^{\frac{2^{n}}{5}}$$

$$= 2^{\frac{2}{5} + \frac{4}{5} + \frac{8}{5} + \dots + \frac{2^n}{5}}$$

The power of 2 forms a GP with common ratio 2.

So, 
$$2^{\frac{2}{5} + \frac{4}{5} + \frac{8}{5} + \dots + \frac{2^n}{5}} = 2^{\frac{2}{5}(2^n - 1)}$$

Note: 26 = 64 and 63 is just bit less than that.

$$\frac{2}{5}(2^n-1)=6$$

$$\Rightarrow 2^{n} - 1 = 15$$

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## Q.13 [11831809]

Two identical circles C1 and C2 of radius 2 cm touch externally. A third circle, C3, touches the circles C1 and C2 externally. If C1, C2 and C3 have a common tangent, then what is the ratio of the area of C3 to that of C2?

1 01:4

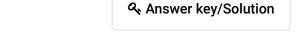
2 0 1:8

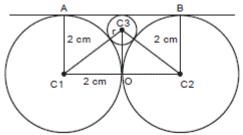
3 0 1:16

4 0 1:32

### Solution:

### **Correct Answer: 3**





Let r be the radius of the circle C3.

Then, 
$$(2 + r)^2 = 2^2 + (2 - r)^2$$

$$\Rightarrow$$
 4 +  $\Gamma^2$  + 4 $\Gamma$  = 4 + 4 +  $\Gamma^2$  - 4 $\Gamma$ 

 $\Rightarrow$  8r = 4  $\Rightarrow$  r = 1/2 cm

Hence, the required ratio of areas =  $\pi \times (1/2)^2$ :  $\pi \times 2^2 = 1$ : 16.

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## Q.14 [11831809]

A tank has N inlet pipes numbered from 1 to N fitted to it and all are opened simultaneously. The rate at which the rth pipe  $(1 \le r \le N)$  fills the tank is r liters/minute. Together, all the N taps take a certain time to fill the tank. If the rate of rth pipe had been  $r^2$  liters/minute the total time taken to fill the tank would have been one-third of the normal time. Find the value of N.

### Solution:

### **Correct Answer: 4**

Answer key/Solution

Total capacity of all the pipes in liters/minute =  $\sum_{r=1}^{N} r$ 

If the capacity of each filling pipe is numerically equal to the square of its pipe number, then total capacity of all pipes

$$= \sum_{r=1}^{N} r^2$$

Now, the time taken to fill the tank would be one-third of the normal time.

Hence, 
$$\sum_{r=1}^{N} r^2 = 3 \times \sum_{r=1}^{N} r$$

$$\Rightarrow$$
 N(N + 1)(2N + 1)/6 = 3N(N + 1)/2  $\Rightarrow$  N = 4.

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## Q.15 [11831809]

If  $\frac{a_1 + a_2 + \dots + a_{11}}{a_{n-10} + \dots + a_{n-2} + a_{n-1} + a_n} = \frac{1}{8}$  and  $\frac{a_{10} + a_{11} + \dots + a_n}{a_1 + a_2 + \dots + a_{n-9}} = 2$ , where  $a_1, a_2, a_3, \dots, a_n$  are in geometric progression, then what is the value of 'n'?

Solution:

**Correct Answer: 38** 

Answer key/Solution

The numbers are in GP, let  $a_1 = a_1$ ,  $a_2 = ar$ , ...,  $a_n = ar^{n-1}$  and so on, where 'r' is the common ratio.

$$\therefore \frac{a_1 + a_2 + \dots + a_{11}}{a_{n-10} + \dots + a_{n-2} + a_{n-1} + a_n} = \frac{1}{8}$$

$$\Rightarrow \frac{a + ar + \dots + ar^{10}}{ar^{n-11} + ar^{n-10} + \dots + ar^{n-1}} = \frac{1}{8}$$

$$\Rightarrow \frac{a(1+r+\cdots+r^{10})}{ar^{n-11}(1+r+\cdots+r^{10})} = \frac{1}{8}$$

And, 
$$\frac{a_{10} + a_{11} + \dots + a_{n}}{a_{1} + a_{2} + \dots + a_{n-9}} = 2$$

$$\Rightarrow \frac{ar^9 + \dots + ar^{n-1}}{a + ar + \dots + ar^{n-10}} = 2$$

$$\Rightarrow \frac{ar^9\left(1+r+\cdots+r^{n-10}\right)}{a\left(1+r+\cdots+r^{n-10}\right)}=2$$

$$\Rightarrow$$
 r<sup>9</sup> = 2 ... (ii)

From (i) and (ii),

$$\frac{n-11}{3} = 9 \Rightarrow n = 38.$$

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# Q.16 [11831809]

Karun borrowed Rs.1.2 lakh at 10% rate of interest compounded annually. He repaid a certain amount at the end of the first year. Then, he paid Rs.90,200 at the end of the second year to completely repay the loan. What amount (in Rs.) did he repay at the end of first year?

1  $\bigcirc$  55,000

2 0 50,000

3 0 45,000

4 0 54,000

### **Correct Answer: 2**

Answer key/Solution

Karun borrowed Rs.1,20,000 at 10% p.a. CI. This becomes Rs.1,32,000 at the end of the 1st year. Let 'k' be the amount repaid at the end of the first year. Hence, principal at the beginning of the second year = (132000 - k) At 10% p.a., this will become  $(1.1) \times (132000 - k) = 145200 - 1.1k = 90200 \Rightarrow 1.1k = 145200 - 90200 = 55000 \Rightarrow k = Rs.50,000.$ 

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# Q.17 [11831809]

Let 
$$f(x) = \frac{2}{4^x + 2}$$
 for real numbers x.

Then, find the value of 
$$f\left(\frac{1}{2023}\right) + f\left(\frac{2}{2023}\right) + f\left(\frac{3}{2023}\right) + \dots + f\left(\frac{2022}{2023}\right)$$
.

### Solution:

### **Correct Answer: 1011**

$$f(x) = \frac{2}{4^x + 2}$$

So 
$$f(1-x) = \frac{2}{4^{1-x}+2} = \frac{2 \times 4^x}{4+2 \times 4^x} = \frac{4^x}{2+4^x}$$

From (i) and (ii), f(x) + f(1 - x) = 1

Hence, the required answer is = 1011.

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## Q.18 [11831809]

The height of a tree varies as the square root of its age. When the tree is 16 months old, its height is 24 cm. What will be its height (in cm) when it is 25 months old?

### Solution:

### **Correct Answer: 30**

$$H\alpha\sqrt{A} \Rightarrow H = k\sqrt{A}$$

$$\Rightarrow 24 = k\sqrt{16} \Rightarrow k = 6$$

Hence, required height = H = 6 × √25 = 30 cm.

Bookmark

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Answer key/Solution

Answer key/Solution

Q.19 [11831809
----------------

If  $y = log_{7-a}(2x^2 + 2x + a + 3)$  for all real values of x, then which of the following is NOT a possible integral value of 'a'?

Answer key/Solution

1 04

2 0 5

3 🔾 -2

4 🔾 -3

### Solution:

### **Correct Answer: 4**

 $2x^2 + 2x + a + 3 > 0$ 

D < 0

Because for D < 0,  $2x^2 + 2x + a + 3 = 0$  at complex values of x only i.e., not possible.

Since x can take real values only.

Hence,  $2x^2 + 2x + a + 3 \neq 0$ , for D < 0.

Or, 
$$a > \frac{-5}{2}$$

Also, 7 - a > 0

Or, a < 7 and  $7 - a \ne 1 \rightarrow a \ne 6$ 

Therefore,  $a \in \left(-\frac{5}{2}, 6\right) \cup (6, 7)$ 

Hence, -3 is not possible.

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## Q.20 [11831809]

Hiten and Ketan run a business and during 2021 the basic salary of Hiten turns out to be equal to 20% of the balance of the profit left after his salary was paid. If Hiten finally received a total of Rs.8,40,000 after splitting the remaining profit equally between the two, then find how much (in Rs. lakh) Ketan received from the profit in 2021.

1 07

2 0 5.4

3 0 6

4 🔾 9

### **Correct Answer: 3**

Answer key/Solution

Let the total profit be x and the salary paid to Hiten be y. y = 20% of  $(x - y) \Rightarrow y = 0.20x - 0.2y \Rightarrow 0.2x = 1.2y \Rightarrow x = 6y \Rightarrow y = x/6$  Profit remaining after Hiten's salary is paid = x - x/6 = 5x/6 This is divided equally among Hiten and Ketan. Hiten gets  $5x/12 + x/6 = 840000 \Rightarrow 7x/12 = 840000 \Rightarrow x = Rs.14,40,000$  Hence, Ketan's salary = 1440000 - 840000 = Rs.6,00,000.

#### Alternate solution:

20% of (x - y) + (x - y)/2 = 8,40,000 $\Rightarrow (x - y)/2 = Rs. 6,00,000.$ 

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### Q.21 [11831809]

For an Inter-Gully Cricket tournament, a team of 6 players needs to be formed. A team contains 2 batsmen, 3 bowlers and 1 wicketkeeper. There are 23 batsmen, 26 bowlers, and 9 wicketkeepers. If the maximum number of teams is formed, then find out the number of players that will not be the part of any team.

Solution:

**Correct Answer: 10** 

Answer key/Solution

Batsmen are 23. Therefore, 23/2 = 11.5, 11 complete sets can be formed.

Bowlers are 21. Therefore, 26/3 = 8.67, 8 complete sets can be formed.

Wicketkeepers are 9, so 9 complete sets can be formed. So exactly 8 complete sets of 6 players can be formed.

Hence, players which will be left are =  $23 - 8 \times 2 + 26 - 8 \times 3 + 9 - 8 \times 1 = 7 + 2 + 1 = 10$ .

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### Q.22 [11831809]

A vertical cell tower LT stands at the center L of a square ABCD of side 32 m. If  $\angle$ ATB = 60°, then the height (in meter) of the cell tower LT is

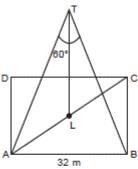
1	$\bigcirc$	32
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2 ○ 20√2

3 ○ 16√2

4 ○ 32√2

## **Correct Answer: 3**



Since  $\angle$ ATB = 60°  $\Rightarrow$  AT = BT Therefore, ATB is an equilateral triangle. So AT = 32 m

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

$$\Rightarrow$$
 AC =  $\sqrt{32^2 + 32^2} = 32\sqrt{2}$  m

So AL =  $16\sqrt{2}$  m

In right angled triangle ALT,

LT = 
$$\sqrt{32^2 - (16\sqrt{2})^2} = 16\sqrt{2} \,\text{m}$$
.

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<u>Answer key/Solution</u>