Career Launcher
Analysis of CAT – 2006
Section – III (Quantitative Ability)
Set – 111

Section III has 25 questions.

51. If a/b = 1/3, b/c = 2, c/d = 1/2, d/e = 3 and e/f = 1/4, then what is the value of abc/def?
(1) 3/8 (2) 27/8 (3) 3/4 (4) 27/4 (5) 1/4

Sol. (1) $\frac{a}{b}=\frac{1}{3} \quad \frac{b}{c}=\frac{2}{1}$
$\Rightarrow$ a : b : c = 2 : 6 : 3
Similarly a : b : c : d : e : f = 6 : 18 : 9 : 18 : 6 : 24
$\therefore \frac{abc}{def}=\frac{6\times18\times9}{18\times6\times24}=\frac{3}{8}$
Hence option (1).

52. If x = –0.5, then which of the following has the smallest value?
(1) $2^{1/x}$ (2) 1/x (3) $1/x^2$ (4) 2^X (5) $1/\sqrt{-x}$

Sol. (2) Go by option, put $x=\frac{-1}{2}$

(1) $2^{-2}=\frac{1}{4}$

(2) $\frac{1}{x} \Rightarrow \frac{1}{-1/2}=-2$

(3) $\frac{1}{x^2} \Rightarrow \frac{1}{(-1/2)^2}=4$

(4) $2^{-1/2}=\frac{1}{\sqrt{2}}$

53. Consider a sequence where the nth term, t_n = n/(n + 2), n = 1, 2, ...
The value of $t_3 \times t_4 \times t_5 \times . . . . \times t_{53}$ equals:
(1) 2/495 (2) 2/477 (3) 12/55 (4) 1/1485 (5) 1/2970

Sol. (1) $t_3t_4t_5...t_{53}$
$\frac{3}{5}\times\frac{4}{6}\times\frac{5}{7}\times.......\times\frac{51}{53}\times\frac{52}{54}\times\frac{53}{55}=\frac{3\times4}{54\times55}=\frac{2}{495}$
Hence option (1)

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54. Which among $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$ and $12^{1/12}$ is the largest?
(1) $2^{1/2}$ (2) $3^{1/3}$ (3) $4^{1/4}$ (4) $6^{1/6}$ (5) $12^{/12}$

Sol. (2) LCM of 2, 3, 4, 6, 12 = 12

$\sqrt[12]{2^6}$ $\sqrt[12]{3^4}$ $\sqrt[12]{4^3}$ $\sqrt[12]{6^2}$ $\sqrt[12]{12^1}$

$\therefore 3^4$ is greatest

Note: $n^{1/n}$ is maximum when n = e (2.718). Among the options n = 3 is closest to the value of e.

55. The length, breadth and height of a room are in the ratio 3 : 2 : 1. If the breadth and height are halved while the length is doubled, then the total area of the four walls of the room will
(1) remain the same (2) decrease by 13.64% (3) decrease by 15%
(4) decrease by 18.75% (5) decrease by 30%

Sol. (5) Area of 4 walls = $x(3x+2x)=5x^2$

$=\frac{x}{2}[7x]=\frac{7x^2}{2}$

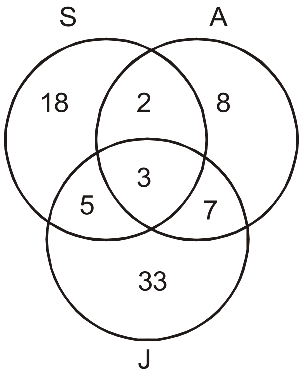
$\frac{5x^2-\frac{7x^2}{2}}{5x^2}$

$\frac{3x^2}{10x^2}=30\%$

56. A survey was conducted of 100 people to find out whether they had read recent issues of Golmal, a monthly magazine. The summarized information regarding readership in 3 months is given below:
Only September: 18; September but not August: 23; September and July: 28;
September: 28; July: 48; July and August: 10;
None of the three months: 24.

What is the number of surveyed people who have read exactly two consecutive issues (out of the three)?
(1) 7 (2) 9 (3) 12 (4) 14 (5) 17

Sol.



So, total people reading the newspaper in consecutive months i.e. July and August and August and Sept. is 2 + 7 = 9 people.

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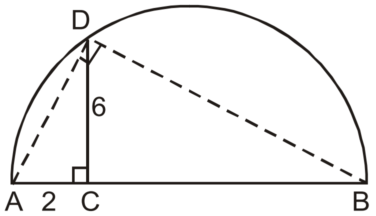
57. A semi-circle is drawn with AB as its diameter. From C, a point on AB, a line perpendicular to AB is drawn meeting the circumference of the semi-circle at D. Given that AC = 2 cm and CD = 6 cm, the area of the semi-circle (in sq. cm) will be:
(1) 32 π (2) 50 π (3) 40.5 π (4) 81 π (5) undeterminable

Sol. (2)



$\angle ADC = 90^\circ$ ($\angle$ in semicircle)

$CD^2 = AC \times CB$

$(6)^2 = 2 \times CB$

$36 = 2 \times CB$

CB = 18

Hence AB = AC + CB = 20

Area of semicircle $= \frac{1}{2}\pi(10)^2 = 50\pi$

Option is (2).

Answer Questions 58 and 59 on the basis of the information given below:
An airline has a certain free luggage allowance and charges for excess luggage at a fixed rate per kg. Two passengers, Raja and Praja have 60 kg of luggage between them, and are charged Rs 1200 and Rs 2400 respectively for excess luggage. Had the entire luggage belonged to one of them, the excess luggage charge would have been Rs 5400.

58. What is the weight of Praja's luggage?
(1) 20kg (2) 25 kg (3) 30 kg (4) 35 kg (5) 40 kg

59. What is the free luggage allowance?
(1) 10kg (2) 5 kg (4) 20 kg (4) 25 kg (5) 30 kg

For questions 58 and 59:

Let for Raja allowed luggage be A and excess luggage be E
Hence for Praja his luggage must be A + 2E of all luggage belongs to one.
(A + 3E) is the excess.
E corresponds to Rs. 1200.
Hence, A must correspond to (5400 – 3600) = Rs. 1800
If E = 2x; A = 3x
So total weight = 2(A) + 3E = 12x
Or x = 5
Hence, Praja's luggage weight = 7x = 35 kg

Alternate method:
Let, Raja = x kg Free allowance = F kg
Praja = (60 – x) kg

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According to question
$(x - F)V = 1200$ … (1) {v = rate of levy on excess luggage}
$(60 - x - F)V = 2400$ … (2)
$(60 - F)V = 5400$ … (3)
Divide (2) equation by (1) equation:

$$\frac{60 - x - F}{x - F} = 2$$

$60 - x - F = 2x - 2F$
$3x - F = 60$ …(4)
Divide (3) equation by (1) equation

$$\frac{60 - F}{x - F} = 4.5$$

$60 - F = 4.5x - 4.5F$
$4.5x - 3.5F = 60$ …(5)
Multiply (4) by 1.5
$4.5x - 1.5F = 90$
$4.5x - 3.5F = 60$

$2F = 30$
$F = 15$
Put F in (4)th equation
$3x = 75 \Rightarrow x = 25$

58. (4) Praja have 35 kg luggage

59. 15 kg (correct answer not present among options)

60. A group of 630 children is arranged in rows for a group photograph session. Each row contains three fewer children than the row in front of it. What number of rows is not possible?
(1) 3 (2) 4 (3) 5 (4) 6 (5) 7

Sol. (4) Let the no. of students in front row be x.
So, the no. of students in next rows be $x - 3$, $x - 6$, $x - 9$…. so on
If n i.e. no. of rows be 3 then no. of students
$x + (x - 3) + (x - 6) = 630$
$3x = 639$
$x = 213$
So possible similarly n = 4
$x + (x - 3) + (x - 6) + (x - 9) = 630$
$4x - 18 = 630$

$$x = \frac{648}{4} = 162$$

If n = 5
$(4x - 18) + (x - 12) = 630$
$5x - 30 = 630$
$x = 120$
Again possible.
If n = 6
$(5x - 30) + (x - 15) = 630$
$6x - 45 = 630$
$6x = 675$
$x \neq$ Integer
Hence $n \neq 6$

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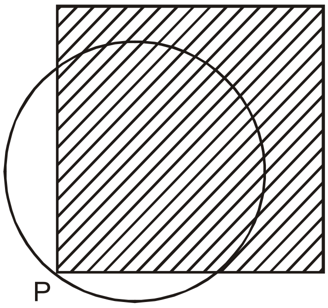
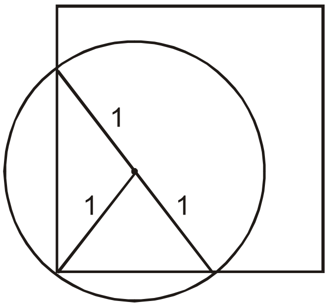
Answer Questions 61 and 62 on the basis of the information given below:
A punching machine is used to punch a circular hole of diameter two units from a square sheet of aluminium of width 2 units, as shown below. The hole is punched such that the circular hole touches one corner P of the square sheet and the diameter of the hole originating at P is in line with a diagonal ofthe square.



61. The proportion of the sheet area that remains after punching is:
(1) $(\pi+2)/8$ (2) $(6-\pi)/8$ (3) $(4-\pi)/4$ (4) $(\pi-2)/4$ (5) $(14-3\pi)/6$

Sol. (2)

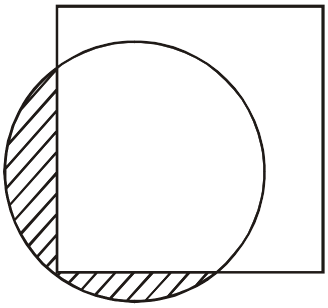


Remaining area = $4-\left(\frac{\pi}{2}+\frac{1}{2}\times1\times2\right)=\frac{6-\pi}{2}$

Remaining proportion = $=\frac{6-\pi}{8}$

62. Find the area of the part of the circle (round punch) falling outside the square sheet.
(1) $\pi/4$ (2) $(\pi-1)/2$ (3) $(\pi-1)/4$ (4) $(\pi-2)/2$ (5) $(\pi-2)/4$

Sol. (4)



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

$=\pi-\frac{\pi}{2}-1=\frac{\pi-2}{2}$

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63. What values of x satisfy $x^{2/3} + x^{1/3} - 2 \le 0$?
(1) $-8 \le x \le 1$ (2) $-1 \le x \le 8$ (3) $1 < x < 8$ (4) $1\ 1 \le x \le 8$ (5) $-8 \le x \le 8$

Sol. (1) $x^{2/3} + x^{1/3} - 2 \le 0$

$\Rightarrow x^{2/3} + 2x^{1/3} - x^{1/3} - 2 \le 0$

$\Rightarrow \left(x^{1/3} - 1\right)\left(x^{1/3} + 2\right) \le 0$

$\Rightarrow -2 \le x^{1/3} \le 1$

$\Rightarrow -8 \le x \le 1$

64. Consider the set S = {1, 2, 3, . . ., 1000}. How many arithmetic progressions can be formed from the elements of S that start with 1 and end with 1000 and have at least 3 elements?
(1) 3 (2) 4 (3) 6 (4) 7 (5) 8

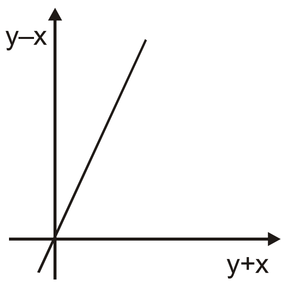
Sol. (4) Let number of elements in progression be n, then

$1000 = 1 + (n-1)d$

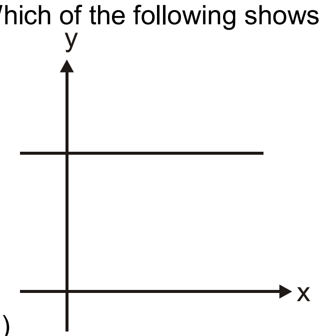
$\Rightarrow (n-1)d = 999 = 3^3 \times 37$

Possible values of $n-1$ = 3, 37, 9, 111, 27, 333, 999
Hence 7 progressions.

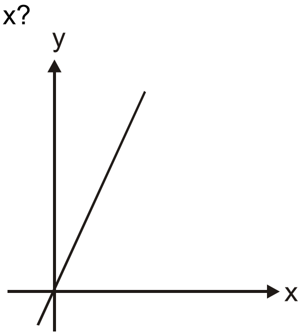
65. The graph of y – x against y + x is as shown below. (All graphs in this question are drawn to scale and the same scale has been used on each axis.)



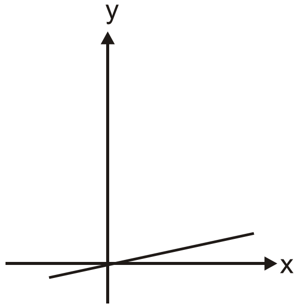
Which of the following shows the graph of y against x?

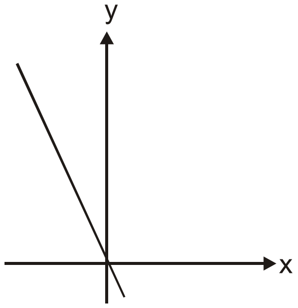


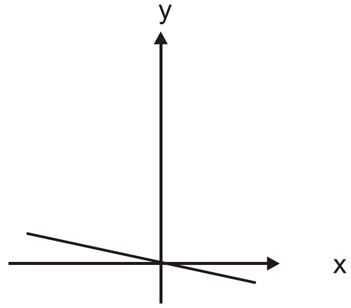
(1)



(2)

(3) 

(4) 

(5) 

Sol. (4) From the graph of (y – x) Vs. (y + x), it is obvious that inclination is more than 45°.

Slope of line = $\frac{y-x}{y+x} = \tan(45^\circ + \theta)$;

$\Rightarrow \frac{y-x}{y+x} = \frac{1+\tan\theta}{1-\tan\theta}$

By componendo-dividendo, $\frac{y}{x} = \frac{-1}{\tan\theta}$ which is nothing but the slope of the line that shows the graph of y Vs. x.

And as $0° < \theta < 45°$, absolute value of $\tan\theta$ is less than 1.

$\frac{-1}{\tan\theta}$ is negative and also, greater than 1.

$\Rightarrow$ The slope of the graph y Vs. x must be negative and greater than 1. Accordingly, only option (4) satisfies.

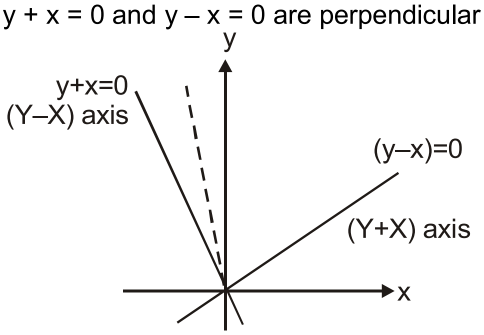
You can also try by putting the values of (y + x) = 2(say) and (y – x) = 4(anything more than 2 for that matter). You can solve for values of y and x and cross check with the given options.

Alternate method:

In the normal X-Y coordinate plane the X-axis corresponds to y = 0

And Y-axis corresponds to x = 0

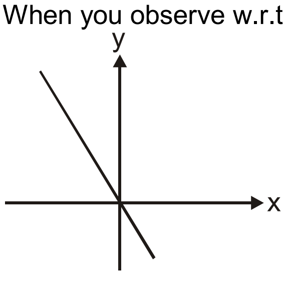
y + x = 0 and y – x = 0 are perpendicular lines on this plane.



And y-x = 0 is the axis Y+X and y+x = 0 is the axis Y-X

So, the dotted line is the graph drawn in the question.

When you observe w.r.t to X-axis it looks like



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66. The sum of four consecutive two-digit odd numbers, when divided by 10, becomes a perfect square. Which of the following can possibly be one of these four numbers?
(1) 21 (2) 25 (3) 41 (4) 67 (5) 73

Sol. (3) By options checking option (3), four consecutive odd numbers are 37, 39, 41 and 43. The sum of these 4 numbers is 160.
When divided by 10, we get 16 which is a perfect square.
$\therefore$ 41 is one of the odd numbers.

67. The number of solutions of the equation 2x + y = 40 where both x and y are positive integers and $x \le y$ is:
(1) 7 (2) 13 (3) 14 (4) 18 (5) 20

Sol. (2) 2x + y = 40
$x \le y$
$\Rightarrow y = 40 - 2x$
Values of x and y that satisfy the equation

x	y
1	38
2	36
3	34
.	.
.	.
.	.
13	14

$\therefore$ 13 values of (x, y) satisfy the equation such that $x \le y$

68. The number of employees in Obelix Menhir Co. is a prime number and is less than 300. The ratio of the number of employees who are graduates and above, to that of employees who are not, can possibly be:
(1) 101 : 88 (2) 87 : 100 (3) 110 : 111 (4) 85 : 98 (5) 97 : 84

Sol. (5) Using options, the sum of the numerator and denominator of the ratio should be a prime number.
Only option (5) satisfies [97 + 84 = 181]

69. There are 6 tasks and 6 persons. Task 1 cannot be assigned either to person 1 or to person 2; task 2 must be assigned to either person 3 or person 4. Every person is to be assigned one task. In how many ways can the assignment be done?
(1) 144 (2) 180 (3) 192 (4) 360 (5) 716

Sol. (1) Task 2 can only be given to two persons i.e. (3 and 4)
$\therefore$ Number of ways = 2 ways
First task can be done in 3 ways by 3 persons.
Third task can be done by 4 persons.
$\therefore$ 4 ways similarly for fourth, five and six tasks, number of ways is 3, 2 and 1 respectively.
$\therefore$ Total number of ways = $2 \times 3 \times 4 \times 3 \times 2 \times 1$ = 144 ways

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70. If $\log_y x = (a \cdot \log_z y) = (b \cdot \log_x z) = ab$, then which of the following pairs of values for (a, b) is not possible?
(1) (–2, 1/2) (2) (1, 1) (3) (0.4, 2.5) (4) (π, 1/π) (5) (2, 2)

Sol. (5) $\log_y^x = a.\log_z^y = b.\log_x^z = a \times b$

$a = \frac{\log_y^x}{\log_z^y}$ and $b = \frac{\log_y^x}{\log_z^y}$

$\Rightarrow a \times b = \frac{\log_y^x}{\log_z^y} \times \left(\frac{\log_y^x}{\log_z^y}\right)$

$= \frac{\left(\frac{\log_k^x}{\log_k^y}\right)}{\left(\frac{\log_k^y}{\log_k^z}\right)} \times \frac{\left(\frac{\log_k^x}{\log_k^y}\right)}{\left(\frac{\log_k^y}{\log_k^z}\right)}$ {For some base k

$= \left(\frac{\log_k^x}{\log_k^y}\right)^3 = \left(\log_y^x\right)^3 = (ab)^3$

So, $ab - a^3b^3 = 0$

Or, $a \times b\left(1 - a^2b^2\right) = 0$

$\Rightarrow ab = \pm 1$

Only option (5) does not satisfy.
Hence (5).

71. What are the values of x and y that satisfy both the equations?

$2^{0.7x}.3^{-1.25y} = 8\sqrt{6}/27$

$4^{0.3x}.9^{0.2y} = 8.(81)^{1/5}$

(1) x = 2,y = 5 (2) x = 2.5, y = 6
(3) x = 3, y = 5 (4) x = 3,y = 4 (5) x = 5, y = 2

Sol. (5) Equation (ii) can be written as

$4^{0.3x} \times 9^{0.2y} = 8 \times (81)^{1/5}$

$(2^2)^{0.3x}(3^2)^{0.2y} = 8 \cdot (81)^{1/5}$

$2^{0.6x}\ 3^{0.4y} = 2^3 \cdot (3^4)^{1/5} = 2^3 \cdot 3^{4/5}$

0.6x = 3 $\Rightarrow$ x = 5

and $0.4y = \frac{4}{5}$

$\Rightarrow y = 2$

If we put the values of x and y in first equation these values satisfy the first equation also.
So the answer is x = 5, y = 2
Hence, option (5)

72. Let f(x) = max(2x + 1, 3 – 4x), where x is any real number. Then the minimum possible value of f(x) is:
(1) 1/3 (2) 1/2 (3) 2/3 (4) 4/3 (5) 5/3

Sol. (5) f(x) = max (2x + 1, 3 – 4x)
So, the two equations are y = 2x + 1 and y = 3 – 4x

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$y - 2x = 1$

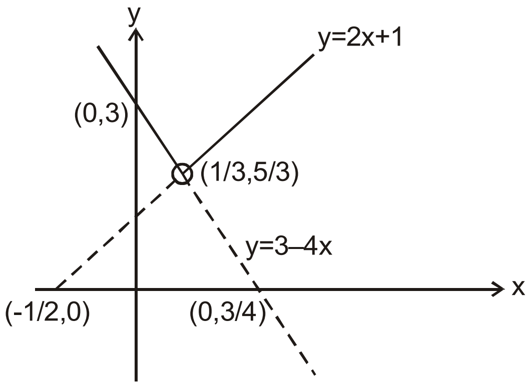
$\frac{y}{1} + \frac{x}{-1/2} = 1$

Similarly y + 4x = 3

$\frac{y}{3} + \frac{x}{3/4} = 1$

Their point of intersection would be
2x + 1 = 3 – 4x
6x = 2

$x = \frac{1}{3}$



So, when $x \le \frac{1}{3}$ then $f(x)_{max} = 3 - 4x$

And when $x \ge \frac{1}{3}$ then $f(x)_{max} = 2x + 1$

Hence the min. of this would be at x = $\frac{1}{3}$

i.e. $y = \frac{5}{3}$

Alternative method:
As f(x) = max (2x + 1, 3 – 4x)
We know that f(x) would be min at the point of intersection of these curves
i.e. 2x + 1 = 3 – 4x
6x = 2
i.e. $x = \frac{1}{3}$ Hence min f(x) is $\frac{5}{3}$

73. When you reverse the digits of the number 13, the number increases by 18. How many other two-digit numbers increase by 18 when their digits are reversed?
(1) 5 (2) 6 (3) 7 (4) 8 (5) 10

Sol. (2) Let the number be 10x + y so when number is reversed the number because 10y + x. So, the number increases by 18
Hence (10y + x) – (10x + y) = 9 (y – x) = 18
y – x = 2
So, the possible pairs of (x, y) is (3, 1) (4, 2) (5, 3) (6, 4), (7, 5) (8, 6) (9, 7)
But we want the number other than 13 so, there are 6 possible numbers are there i.e. 24, 35, 46, 57, 68, 79.
So total possible numbers are 6.

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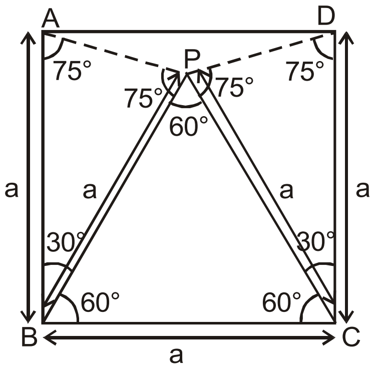
74. An equilateral triangle BPC is drawn inside a square ABCD. What is the value of the angle APD in degrees?
(1) 75 (2) 90 (3) 120 (4) 135 (5) 150

Sol. (5)



$\angle PBC = \angle CPB = \angle BPC = 60°$ (L's of equilateral triangle)

PC = CD (both a)

Also $\angle CPD = \angle PDC = \frac{180° - 30°}{2} = 75°$

Similarly, $\angle BAP = \angle BPA = 75°$

$\angle APD = 360° - 75° - 75° - 60° = 150°$

75. Arun, Barun and Kiranmala start from the same place and travel in the same direction at speeds of 30, 40 and 60 km per hour respectively. Barun starts two hours after Arun. If Barun and Kiranmala overtake Arun at the same instant, how many hours after Arun did Kiranmala start?
(1) 3 (2) 3.5 (3) 4 (4) 4.5 (5) 5

Sol. (3) Let us assume that Arun started running at 10 AM and Barun started at 12 noon. So, in these two hours distance traveled by Arun is 60 km and the relative speed of Barun w.r.t Arun is 10 km/hr. So Barun will overtake Arun after = $\frac{60}{10}$ = 6 hours

So, Barun reaches there at 6 PM.

So, Kiranmala also overtakes Arun at 6 PM.

Let us assume Kiranmala takes 't' time to overtake Arun and the relative speed of Kiranmala w.r.t Arun is 30 km/hr and Arun ran for 8 hrs.

So, distance travelled by Arun is 30×8

While Kiranmala's distance traveled is $60 \times t = 30 \times 8$

t = 4 hours

So, after 4 hrs, Kiranmala will start running.

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