

HOTEL MANAGEMENT

National Council for Hotel
Management & Catering Technology

SOLVED PAPER 2016

Time Allowed : 3 hrs

Max. Marks : 200

Instructions

- There are five sections in this solved paper.
- For every correct attempt 1 mark will be awarded.
- All questions are in MCQs form and each having four options.

Numerical Ability and Analytical Aptitude

1. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is

(a) 250 (b) 276 (c) 280 (d) 285

Sol. (d) A 30 days month beginning with Sunday has 5 Sunday.

$$\begin{aligned}\therefore \text{Required average} &= \frac{510 \times 5 + 240 \times 25}{30} \\ &= \frac{2550 + 6000}{30} \\ &= \frac{8550}{30} = 285\end{aligned}$$

2. A number when divided by 6 leaves a remainder 3. When the square of the number is divided by 6, then the remainder is

(a) 0 (b) 1 (c) 2 (d) 3

Sol. (d) Let the number be x .

According to the question,

$$\begin{aligned}x &= 6q + 3 \Rightarrow x^2 = (6q + 3)^2 \\ &= 36q^2 + 9 + 36q \\ &= 36q^2 + 36q + 6 + 3 \\ &= 6(6q^2 + 6q + 1) + 3\end{aligned}$$

Hence, the remainder is 3.

3. Find the sum of all even natural numbers less than 75.

(a) 1410 (b) 1406
(c) 1408 (d) 1412

Sol. (b) We know that, sum of even natural numbers
 $= n(n+1)$

$$\begin{aligned}\text{where, } n &= \frac{\text{First number} + \text{Last number}}{2} - 1 \\ &= \frac{2 + 74}{2} - 1 = 38 - 1 = 37\end{aligned}$$

$$\therefore \text{Required sum} = 37 \times 38 = 1406$$

4. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 s, respectively. In 30 min, how many times do they toll together?

(a) 4 (b) 10
(c) 15 (d) 16

Sol. (d) Time after which bells toll together

$$\begin{aligned}&= \text{LCM}(2, 4, 6, 8, 10, 12) = 120 \text{ s} \\ &= 2 \text{ min}\end{aligned}$$

$$\begin{aligned}\text{In 30 min, the bells will toll together} &= \left(\frac{30}{2} + 1\right) \\ &= 16 \text{ times}\end{aligned}$$

5. Mr. Bhaskar is on tour and he has ₹ 360 for his expenses. If he exceeds his tour by 4 days, he must cut down his daily expenses by ₹ 3. For how many days is Mr. Bhaskar on tour?

(a) 18 (b) 19 (c) 21 (d) 20

Sol. (d) Let the number of tour days be x and daily expense be ₹ y .

According to the question,

$$xy = 360$$

$$\text{and } (x+4)(y-3) = 360$$

$$\Rightarrow xy + 4y - 3x - 12 = 360$$

$$\Rightarrow 4y - 3x = 12$$

$$[\because xy = 360]$$

$$\Rightarrow 4\left(\frac{360}{x}\right) - 3x = 12$$

$$\Rightarrow 1440 - 3x^2 = 12x$$

$$\Rightarrow 3x^2 + 12x - 1440 = 0$$

$$\Rightarrow x^2 + 4x - 480 = 0$$

$$\therefore x = \frac{-4 \pm \sqrt{4^2 - 4 \times (-480)}}{2} = \frac{-4 \pm \sqrt{16 + 1920}}{2}$$

$$= \frac{-4 \pm \sqrt{1936}}{2} = \frac{-4 \pm 44}{2} = 20$$

6. If $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a+b\sqrt{3}$, then

(a) $a = -11, b = -6$

(b) $a = -11, b = 6$

(c) $a = 11, b = -6$

(d) $a = 6, b = 11$

Sol. (c) Given, $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a+b\sqrt{3}$

Consider, $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}$

Rationalise the denominator

$$\text{i.e. } \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}} = \frac{(5+2\sqrt{3})(7-4\sqrt{3})}{7^2 - (4\sqrt{3})^2}$$

$$[\because a^2 - b^2 = (a+b)(a-b)]$$

$$= \frac{35 - 20\sqrt{3} + 14\sqrt{3} - 24}{49 - 48} = 11 - 6\sqrt{3} = a + b\sqrt{3}$$

$$\therefore a = 11, b = -6$$

7. Three-fifth of the square of a certain number is 126.15. What is the number?

(a) 14.5

(b) 75.69

(c) 145

(d) 210.25

Sol. (a) Let the number be x .

According to the question,

$$\frac{3}{5}x^2 = 126.15$$

$$\Rightarrow x^2 = 126.15 \times \frac{5}{3}$$

$$\Rightarrow x^2 = 210.25$$

$$\therefore x = 14.5$$

8. The HCF of two number is 8. Which one of the following can never be their LCM?

(a) 24

(b) 48

(c) 56

(d) 60

Sol. (d) Given, HCF of two numbers = 8

We know that, HCF is always a factor of LCM.

$\therefore$ Among the given options, 60 cannot be the LCM of the numbers.

9. Simplify $\frac{5.32 \times 56 + 5.32 \times 44}{(7.66)^2 - (2.34)^2}$

(a) 7.2

(b) 8.5

(c) 10

(d) 12

Sol. (c) We have,

$$\frac{532 \times 56 + 532 \times 44}{(7.66)^2 - (2.34)^2} = \frac{532(56 + 44)}{(7.66 + 2.34)(7.66 - 2.34)}$$

$$= \frac{532(100)}{10 \times 532} = 10$$

10. If $15x = 0.04y$, then the value of $\left(\frac{y-x}{y+x}\right)$ is

(a) $\frac{730}{77}$

(b) $\frac{73}{77}$

(c) $\frac{73}{77}$

(d) None of these

Sol. (b) We have, $15x = 0.04y$

$$\Rightarrow \frac{x}{y} = \frac{0.04}{15} = \frac{4}{150} = \frac{2}{75}$$

$$\therefore \left(\frac{y-x}{y+x}\right) = \frac{y\left(1-\frac{x}{y}\right)}{y\left(1+\frac{x}{y}\right)} = \frac{1-\frac{x}{y}}{1+\frac{x}{y}} = \frac{1-\frac{2}{75}}{1+\frac{2}{75}} = \frac{73}{77}$$

11. In measuring the sides of a rectangle, one side is taken 5% in excess and other 4% in deficit. Find the error per cent in the area calculated from these measurements.

(a) 1%

(b) 0.9%

(c) 0.8%

(d) 0.85%

Sol. (c) Let the original length be l and breadth be b .

$$\text{Then, new length} = \frac{105}{100}l$$

$$\text{New breadth} = \frac{96}{100}b$$

$$\therefore \text{Percentage error} = \left(\frac{\frac{105}{100} \times \frac{96}{100} lb - lb}{lb} \right) \times 100$$

$$= \frac{10080 lb - 10000 lb}{10000 lb} \times 100$$

$$= \frac{80}{100} = 0.8\%$$

12. In a two-digit number, the digit in the unit's place is four times the digit in ten's place and sum of the digits is equal to 10. What is the number?

(a) 14

(b) 41

(c) 82

(d) None of these

Sol. (d) Let two-digit number be $10x + y$.

According to the question,

$$y = 4x \text{ and } x + y = 10$$

$$\Rightarrow x + 4x = 10 \Rightarrow x = \frac{10}{5} = 2$$

$$\therefore y = 4x = 8$$

Hence, the required number is 28.

- When the numerator of a fraction increases by 4, the fraction increases by $\frac{2}{3}$. The denominator of the fraction is

(a) 2 (b) 3 (c) 4 (d) 6

1. (d) Let the original fraction be $\frac{x}{y}$.

According to the question,

$$\begin{aligned}\frac{x+4}{y} &= \frac{x}{y} + \frac{2}{3} \\ \Rightarrow \frac{x+4}{y} - \frac{x}{y} &= \frac{2}{3} \Rightarrow \frac{x+4-x}{y} = \frac{2}{3} \\ \Rightarrow \frac{4}{y} &= \frac{2}{3} \Rightarrow y = \frac{4 \times 3}{2} = 6\end{aligned}$$

Hence, the denominator is 6.

2. The ratio between the present ages of P and Q is 6 : 7. If Q is 4 yr older than P, what will be the ratio of the ages of P and Q after 4 yr?

(a) 3 : 4 (b) 3 : 5
(c) 4 : 3 (d) None of these

1. (d) Let the age of P and Q be 6x and 7x, respectively.

Now, $7x = 6x + 4$

$\therefore x = 4$

$\Rightarrow$ Age of P = $6x = 6 \times 4 = 24$ yr

and age of Q = $7x = 7 \times 4 = 28$ yr

$\therefore$ Ratio of ages after 4 yr = $\frac{24+4}{28+4} = \frac{28}{32} = \frac{7}{8}$

3. If the cost of x m of wire is ₹ d, then what is the cost of y m of wire at the same rate?

(a) ₹ $\left(\frac{xy}{d}\right)$ (b) ₹ (xd) (c) ₹ (yd) (d) ₹ $\left(\frac{yd}{x}\right)$

1. (d) Given, cost of x m of wire = ₹ d

Cost of 1 m of wire = ₹ $\frac{d}{x}$

Cost of y m of wire = ₹ $\frac{dy}{x}$

4. Two pipes A and B can fill a tank in 24 min and 32 min, respectively. If both the pipes are opened simultaneously, after how much time B should be closed, so that the tank is full in 18 min?

(a) 7 (b) 8 (c) 9 (d) 10

1. (b) Part of tank filled by A in 1 min = $\frac{1}{24}$

Part of tank filled by B in 1 min = $\frac{1}{32}$

Let pipe B should be used for x min.

$\Rightarrow \frac{18}{24} + \frac{x}{32} = 1$

$\Rightarrow \frac{x}{32} = 1 - \frac{18}{24} = \frac{6}{24}$

$\Rightarrow x = \frac{6}{24} \times 32 = 8$ min

So, pipe B should be closed after 8 min.

5. In a stream running at 2 km/h, a motorboat goes 6 km upstream and back again to the starting point in 33 min. Find the speed of the motorboat in still water.

(a) 21 km/h (b) 22 km/h
(c) 24 km/h (d) 23 km/h

- Sol. (b) Given, speed of stream = 2 km/h

Total distance = 12 km

Total time = 33 min = $\frac{33}{60}$ h

Let speed of boat in still water = x km/h

$\therefore$ Downstream speed = $x + 2$

and upstream speed = $x - 2$

$\Rightarrow \frac{6}{x+2} + \frac{6}{x-2} = \frac{33}{60}$

$\Rightarrow \frac{6x-12+6x+12}{x^2-4} = \frac{33}{60} \Rightarrow 12x = 33 \left(\frac{x^2-4}{60} \right)$

$\Rightarrow \frac{12x \times 60}{33} = x^2 - 4$

$\Rightarrow \frac{240x}{11} = x^2 - 4$

$\Rightarrow 240x = 11x^2 - 44$

$\Rightarrow 11x^2 - 44 - 240x = 0$

$\therefore x = \frac{240 \pm \sqrt{(240)^2 + 4 \times 11 \times 44}}{11 \times 2}$

$= \frac{240 \pm \sqrt{57600 + 1936}}{22}$

$= \frac{240 \pm 244}{22} = \frac{484}{22} = 22$

Hence, speed of boat in still water is 22 km/h.

6. If the sales tax be reduced from $3\frac{1}{2}\%$ to $3\frac{1}{3}\%$,

then what difference does it make to a person who purchases an article with marked price of ₹ 8400?

(a) ₹ 13 (b) ₹ 12 (c) ₹ 14 (d) ₹ 15

- Sol. (c) Given, marked price = ₹ 8400

$\therefore$ Required difference = $8400 \times \left(\frac{7}{2} - \frac{10}{3} \right) \times \frac{1}{100}$
 $= 8400 \times \frac{1}{6} \times \frac{1}{100} = \frac{84}{6} = ₹ 14$

7. A man bought a horse and a carriage for ₹ 3000. He sold the horse at a gain of 20% and the carriage at a loss of 10%, thereby gaining 2% on the whole. Find the cost of the horse.

(a) ₹ 1100 (b) ₹ 1200
(c) ₹ 1250 (d) ₹ 1150

- Sol. (b) Let the cost of horse be ₹ x.

Then, cost of carriage = ₹ (3000 - x)

Now, SP of horse = $\frac{120}{100}x$

$$\begin{aligned}\text{and SP of carriage} &= \frac{90}{100} (3000 - x) \\ \therefore \text{Total SP} &= \frac{120}{100}x + \frac{90}{100} (3000 - x) \\ &= \frac{120x - 90x + 270000}{100} \\ &= \frac{30x + 270000}{100} = 2700 + 0.3x\end{aligned}$$

$$\text{Hence, } \frac{(2700 + 0.3x) - 3000}{3000} \times 100 = 2$$

$$\Rightarrow \frac{0.3x - 300}{3000} \times 100 = 2$$

$$\Rightarrow 0.3x - 300 = 60$$

$$\Rightarrow x = \frac{60 + 300}{0.3} = \frac{360 \times 10}{3} = 1200$$

So, cost of horse is ₹ 1200.

20. Two numbers are in the ratio 3 : 5. If 9 is subtracted from each, the new numbers are in the ratio 12 : 23. The smaller number is

(a) 27 (b) 33 (c) 49 (d) 55

Sol. (b) Let the number be $3x$ and $5x$, respectively.

According to the question,

$$\frac{3x - 9}{5x - 9} = \frac{12}{23}$$

$$\Rightarrow 23(3x - 9) = 12(5x - 9)$$

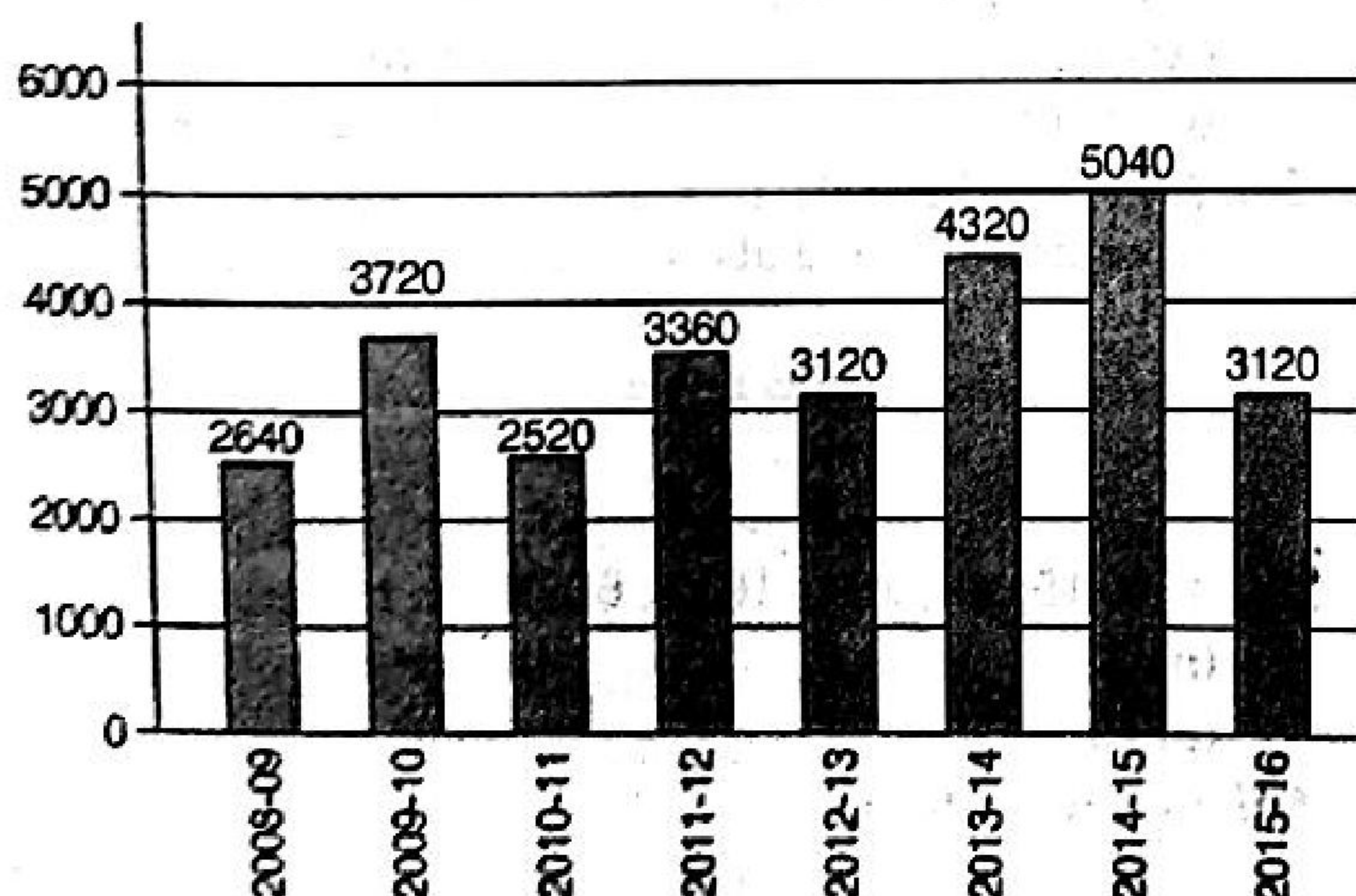
$$\Rightarrow 69x - 207 = 60x - 108$$

$$\Rightarrow 9x = 99 \Rightarrow x = 11$$

Hence, smaller numbers is $3x = 33$.

Directions (Q. Nos. 21-25) The bar graph given below shows the foreign exchange reserves of a country (in million US \$) from 2008-09 to 2015-16. Answer the questions based on this graph.

Foreign exchange reserves of a country
(in million US \$)



21. The ratio of the number of years in which the foreign exchange reserves are above the average reserves to those in which the reserves are below the average reserves is
- (a) 2 : 6 (b) 3 : 5 (c) 4 : 4 (d) 5 : 3

Sol. (b) Average foreign exchange reserves over the period

$$\begin{aligned}&= \frac{2640 + 3720 + 2520 + 3360 + 3120 + 4320 + 5040 + 3120}{8} \\ &= \frac{27840}{8} = 3480\end{aligned}$$

$$\therefore \text{Required ratio} = \frac{3}{5} = 3 : 5$$

22. The foreign exchange reserves in 2014-15 was how many times that in 2011-12?

(a) 0.7 (b) 1.2
(c) 1.4 (d) 1.5

Sol. (d) Reserves in 2014-15 = 5040

Reserves in 2011-12 = 3360

$$\Rightarrow \frac{5040}{3360} = 1.5$$

23. What was the percentage increase in the foreign exchange reserves in 2014-15 over 2010-11?

(a) 100% (b) 150%
(c) 200% (d) 620%

$$\begin{aligned}\text{Sol. (a) Required percentage} &= \frac{5040 - 2520}{2520} \times 100 \\ &= \frac{2520}{2520} \times 100 \\ &= 100\%\end{aligned}$$

24. For which year, the per cent increase of foreign exchange reserves over the previous year is the highest?

(a) 2009-10 (b) 2010-11
(c) 2011-12 (d) 2013-14

Sol. (a) Percentage increase over the previous year in

$$2009-10 = \frac{3720 - 2640}{2640} \times 100 = 40.9\%$$

$$2010-11 = \text{Percentage has decreased}$$

$$2011-12 = \frac{3360 - 2520}{2520} \times 100 = 33.33\%$$

$$2013-14 = \frac{4320 - 3120}{3120} \times 100 = 38.46\%$$

Hence, the highest increase was in the year 2009-10.

25. The foreign exchange reserves in 2013-14 were approx what per cent of the average foreign exchange reserves over the period under review?

(a) 95% (b) 110%
(c) 115% (d) 125%

Sol. (d) Average foreign exchange over the period = 3480

$$\begin{aligned}\therefore \text{Required percentage} &= \frac{4320}{3480} \times 100 \\ &= 125\%\end{aligned}$$

DIRECTIONS (Q. Nos. 26-30) The following table gives the percentage of marks obtained by seven students in six different subjects in an examination. Study the table and answer the questions based on it. The numbers in the brackets show the maximum marks in each subject.

Students	Subjects					
	Maths (150)	Chemistry (130)	Physics (120)	Geography (100)	History (60)	Computer Science (40)
Aditi	90	50	90	60	70	80
Aman	100	80	80	40	80	70
Sapan	90	60	70	70	90	70
Rahul	80	65	80	80	60	60
Mukesh	80	65	85	95	50	90
Tanvi	70	75	65	85	40	60
Sanjay	65	35	50	77	80	80

26. In which subject is the overall percentage the best?

- (a) Maths (b) History
(c) Physics (d) Chemistry

Sol. (a) We shall find the overall percentage with respect to each subject.

$$\text{I. Maths} = \frac{1}{7} (90 + 100 + 90 + 80 + 80 + 70 + 65) \\ = \frac{1}{7} \times 575 = 82.14\%$$

$$\text{II. History} = \frac{1}{7} (70 + 80 + 90 + 60 + 50 + 40 + 80) \\ = \frac{1}{7} \times 470 = 67.14\%$$

$$\text{III. Physics} = \frac{1}{7} (90 + 80 + 70 + 80 + 85 + 65 + 50) \\ = \frac{1}{7} \times 520 = 74.29\%$$

$$\text{IV. Chemistry} = \frac{1}{7} (50 + 80 + 60 + 65 + 65 + 75 + 35) \\ = \frac{1}{7} \times 430 = 61.43\%$$

Hence, the overall percentage is best in Maths.

27. What was the aggregate of marks obtained by Sapan in all the six subjects?

- (a) 409 (b) 419
(c) 429 (d) 449

Sol. (d) Aggregate marks obtained by Sapan

$$= 90\% \text{ of } 150 + 60\% \text{ of } 130 + 70\% \text{ of } 120 + 70\% \\ \text{of } 100 + 90\% \text{ of } 60 + 70\% \text{ of } 40 \\ = 135 + 78 + 84 + 70 + 54 + 28 = 449$$

28. What is the overall percentage of Sanjay?

- (a) 52.5% (b) 55%
(c) 60% (d) 64.5%

Sol. (c) Aggregate marks obtained by Sanjay

$$= 65\% \text{ of } 150 + 35\% \text{ of } 130 + 50\% \text{ of } 120 + 77\% \\ \text{of } 100 + 80\% \text{ of } 60 + 80\% \text{ of } 40 \\ = 97.5 + 45.5 + 60 + 77 + 48 + 32 = 360$$

$$\text{Total marks} = 150 + 130 + 120 + 100 + 60 + 40 \\ = 600$$

$$\therefore \text{Required percentage} = \frac{360}{600} \times 100 = 60\%$$

29. What are the average marks (approx.) obtained by all the seven students in Physics?

- (a) 77.26 (b) 89.14
(c) 91.37 (d) 96.11

Sol. (b) Required average

$$= \frac{1}{7} [90\% \text{ of } 120 + 80\% \text{ of } 120 + 70\% \text{ of } 120 + 80\% \text{ of } 120 + 85\% \text{ of } 120 + 65\% \text{ of } 120 + 50\% \text{ of } 120]$$

$$= \frac{1}{7} \times 120 [90\% + 80\% + 70\% + 80\% + 85\% + 65\% + 50\%] \\ = \frac{1}{7} \times 120 \times \frac{520}{100} = 89.14\%$$

30. The number of student (s) who obtained 60% and above marks in all the subjects is

- (a) one (b) two
(c) three (d) None of these

Sol. (b) From the table, it is clear that Sapan and Rahul obtained 60% and above marks in all the subjects.