

## Section I. Quantitative Skills

### Question 1

Given that the integers 1, 2, 3 ... 40 are written on the blackboard. Any two numbers, say  $a$  and  $b$ , are erased and a new number  $a + b - 1$  is written. This operation is repeated 39 times.

In this manner, the numbers 1, 2, 3 ... 40 are added and 1 is subtracted 39 times.

So, number left on the blackboard

$$= 1 + 2 + 3 \dots 40 - (39 \times 1)$$

$$= \frac{40 \times 41}{2} - 39$$

$$= 20 \times 41 - 39$$

$$= 820 - 39 = 781$$

**The correct answer is B.**

### Question 2

Divisibility rule of 11 says that the difference of the alternative sum of the digits should be a multiple of 11.

Therefore, the number AB61 will be a divisible by 11 if  $(A - B + 6 - 1)$  is multiple of 11.

That is,  $A - B + 6 - 1 = 11k$

$$\Rightarrow A - B = 11k - 5$$

$$\Rightarrow A - B = -5$$

Therefore, possible pairs of  $A$  and  $B$  are (1, 6), (2, 7), (3, 8) and (4, 9).

Hence, 4 such four-digit numbers are possible.

**The correct answer is B.**

### Question 3

Let Sumeet's salary be \$  $x$ .

Amount spent on child's education = 10% of \$  $x = \$ 0.1x$

Remaining amount = \$  $x - \$ 0.1x = \$ 0.9x$

Amount spent on rent = 20% of \$  $0.9x = \$ 0.18x$

Remaining amount = \$  $0.9x - \$ 0.18x = \$ 0.72x$

Amount spent on garments = 25% of \$  $0.72x = \$ 0.18x$

Remaining amount = \$  $0.72x - \$ 0.18x = \$ 0.54x$

According to the question,

$$\$ 0.54x = \$ 5400$$

$$\Rightarrow x = \$ 10,000$$

Hence, Sumeet's salary = \$ 10,000

**The correct answer is A.**

### Question 4

Suppose the price of 1 kg of a goods be Rs. 100.

So, the price of 800 gm of the goods = Rs. 80

Discount offered on the goods = 20% of Rs. 100 = Rs. 20

So, the selling price of the goods = Rs. 80 per kg

Therefore, the cost price and the selling price of 800 gm of the goods are same.

Hence, there is no profit or loss.

**The correct answer is C.**

**Question 5**

$$x^2 - (A - 3)x - (A - 7) = 0$$

The sum of the roots ( $\alpha + \beta$ ) and the product of the roots ( $\alpha\beta$ ) for a quadratic equation,  $ax^2 + bx + c = 0$ , is given by

$$\alpha + \beta = -\frac{b}{a} = A - 3$$

$$\alpha\beta = \frac{c}{a} = -(A - 7)$$

According to the question,

$$\alpha^2 + \beta^2 = 0$$

$$\Rightarrow (\alpha + \beta)^2 - 2\alpha\beta = 0$$

$$\Rightarrow (A - 3)^2 + 2(A - 7) = 0$$

$$\Rightarrow A^2 - 6A + 9 + 2A - 14 = 0$$

$$\Rightarrow A^2 - 4A - 5 = 0$$

$$\Rightarrow A^2 - 5A + A - 5 = 0$$

$$\Rightarrow A(A - 5) + 1(A - 5) = 0$$

$$\Rightarrow (A - 5)(A + 1) = 0$$

$$\Rightarrow A = 5 \text{ or } -1$$

**The correct answer is C.**

**Question 6**

Number of members from Executive Council = 5

Number of members from Academic Council = 7

A committee of 6 members is to be formed such that at least 4 members of the committee should belong to the Academic Council.

So, required number of ways

$$= {}^7C_4 \times {}^5C_2 + {}^7C_5 \times {}^5C_1 + {}^7C_6$$

$$= \frac{5 \times 6 \times 7}{2 \times 3} \times \frac{4 \times 5}{2} + \frac{6 \times 7}{2} \times 5 + 7$$

$$= 350 + 105 + 7 = 462$$

**The correct answer is E.**

**Question 7**

1.

Total population in Uttar Pradesh in 2001 = 1660 lakhs

Male population in Uttar Pradesh in 2001 = 875 lakhs

So, female population in Uttar Pradesh in 2001 = (1660 - 875) lakhs = 785 lakhs

Total population in Uttar Pradesh in 2006 = 1731 lakhs

Male population in Uttar Pradesh in 2006 = 911 lakhs

So, female population in Uttar Pradesh in 2006 = (1731 - 911) lakhs = 820 lakhs

Increase in female population in Uttar Pradesh from 2001 to 2006 = (820 - 785) lakhs = 35 lakhs

$$\text{So, required percentage} = \frac{35}{785} \times 100 = 4.46\%$$

**The correct answer is E.**

2.

$$\text{Number of males per square metre in Uttar Pradesh in 2006} = \frac{911 \text{ lakhs}}{2,38,576} \approx 382$$

$$\text{Number of males per square metre in Madhya Pradesh in 2006} = \frac{360 \text{ lakhs}}{3,08,144} \approx 177$$

$$\text{Number of males per square metre in Andhra Pradesh in 2006} = \frac{417 \text{ lakhs}}{2,75,068} \approx 152$$

$$\text{Number of males per square metre in Tamil Nadu in 2006} = \frac{348 \text{ lakhs}}{1,30,058} \approx 268$$

$$\text{Number of males per square metre in Orissa in 2006} = \frac{195 \text{ lakhs}}{1,55,707} \approx 125$$

Therefore, the number of males per square metre is the least in Orissa in 2006.

**The correct answer is E.**

3.

The simple annual growth rate (SAGR) is simply the percent growth divided by N, the number of years.

In question (1), we calculated the percentage increase in the female population in Uttar Pradesh from 2001 to 2006 = 4.46%

$$\text{Therefore, SAGR of the female population in Uttar Pradesh from 2001 to 2006} = \frac{4.46}{5} = 0.89\%$$

**The correct answer is D.**

4.

The average percentage of rural population in the given states in the year 2001

$$= \frac{71+72+69+70+73+68+69}{7} = \frac{492}{7} = 70.28\%$$

**The correct answer is D.**

### Question 8

**Common solution for question 1-4:**

Given information can be tabulated as below:

<b>Table 1: Automobile Production Trends</b>				
	<b>Passenger Vehicles</b>	<b>Commercial Vehicles</b>	<b>Three Wheelers</b>	<b>Total</b>
<b>2004</b>	800	500	475	1775
<b>2005</b>	700	550	450	1700
<b>2006</b>	1025	675	475	2175
<b>2007</b>	1200	650	475	2325
<b>2008</b>	1250	600	350	2200

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<b>Table 2: Automobile Domestic Sales Trends</b>				
	<b>Passenger Vehicles</b>	<b>Commercial Vehicles</b>	<b>Three Wheelers</b>	<b>Total</b>
<b>2004</b>	700	450	300	1450
<b>2005</b>	675	500	350	1525
<b>2006</b>	900	625	400	1925
<b>2007</b>	1050	600	375	2025
<b>2008</b>	975	550	350	1875
<b>Total</b>	<b>4300</b>	<b>2725</b>	<b>1775</b>	<b>8800</b>

Now, all questions can be solved easily.

1.

From table 1, we have the following data:

$$\text{Percentage increase in automobile production in 2005 over 2004} = \frac{1700 - 1775}{1775} \times 100 = -4.22\%$$

$$\text{Percentage increase in automobile production in 2006 over 2005} = \frac{2175 - 1700}{1700} \times 100 = 27.94\%$$

$$\text{Percentage increase in automobile production in 2007 over 2006} = \frac{2325 - 2175}{2175} \times 100 = 6.89\%$$

$$\text{Percentage increase in automobile production in 2008 over 2007} = \frac{2200 - 2325}{2325} \times 100 = -5.37\%$$

Hence, 2008 exhibits the highest percentage decrease over 2007 in automobile production.

**The correct answer is E.**

2.

Since, whatever was not sold domestically was exported, the annual export data can be tabulated as below:

<b>Automobile Export Sales Trends</b>				
	<b>Passenger Vehicles</b>	<b>Commercial Vehicles</b>	<b>Three Wheelers</b>	<b>Total</b>
<b>2004</b>	100	50	175	325
<b>2005</b>	25	50	100	175
<b>2006</b>	125	50	75	250
<b>2007</b>	150	50	100	300
<b>2008</b>	275	50	0	325

$$\text{Growth in exports of automobiles in 2005} = \frac{175 - 325}{325} \times 100 = -46.15\%$$

$$\text{Growth in exports of automobiles in 2006} = \frac{250 - 175}{175} \times 100 = 42.85\%$$

$$\text{Growth in exports of automobiles in 2007} = \frac{300 - 250}{250} \times 100 = 20\%$$

$$\text{Growth in exports of automobiles in 2008} = \frac{325 - 300}{300} \times 100 = 8.33\%$$

Hence, the maximum growth is in the year 2006 and the minimum growth is in the year 2008.

**The correct answer is C.**

3.

From table 2, we have the following data:

Domestic sale of commercial vehicle during the period 2004–2008 = 2725

Domestic sale of passenger vehicle during the period 2004–2008 = 4300

Domestic sale of three-wheeler during the period 2004–2008 = 1715

Ratio of the domestic sale price of a commercial vehicle, a passenger vehicle, and a three-wheeler = 5 : 3 : 2

Required percentage

$$\begin{aligned} &= \frac{2725 \times 5}{2725 \times 5 + 4300 \times 3 + 1715 \times 2} \times 100 \\ &= \frac{13625}{13625 + 12900 + 3430} \times 100 \\ &= \frac{13625}{29955} \times 100 = 45.48\% \approx 45\% \end{aligned}$$

**The correct answer is C.**

4.

From table 2, we conclude that domestic sale increases in the years 2005, 2006 and 2007 only.

From table 1, we conclude that production increases in the years 2006 and 2007 only.

So, we have to compare the ratios for the years 2006 and 2007 only.

Ratio between absolute increase in domestic sales and absolute increase in production in the year 2006 =

$$\frac{400}{475} = 0.84$$

Ratio between absolute increase in domestic sales and absolute increase in production in the year 2007 =

$$\frac{100}{150} = 0.67$$

Therefore, the ratio is highest during 2006.

**The correct answer is C.**

### Question 9

**From statement 1:**

$$x + y = \text{Even}$$

$$x^2 - y^2 = (x + y)(x - y) = (\text{Even}) \times (x - y)$$

When an even number is multiplied by another even number, the result is always an even and when an even number is multiplied by an odd number, again the result is always an even. Therefore, we get a unique answer from statement 1 alone.

So, statement 1 alone is sufficient.

**From statement 2:**

$$x - y = \text{Odd}$$

$$x^2 - y^2 = (x + y)(x - y) = (x + y) (\text{Odd})$$

When an odd number is multiplied by another odd number, the result is always an odd number while when an odd number is multiplied by an even number, the result is always an even number. Therefore, we do not get a unique answer from statement 2.

So, statement 2 alone is not sufficient.

**The correct answer is A.**