GRADE **8**

BMO *Bloom Maths Olympiad*

Bloom Maths Olympiad
Sample Paper 1

Maximum Time : 60 Minutes   **Maximum Marks : 60**

INSTRUCTIONS

1. There are 50 Multiple Choice Questions in this paper divided into two sections :

   Section A   40 MCQs; 1 Mark each
   Section B   10 MCQs; 2 Marks each

2. Each question has Four Options out of which **ONLY ONE** is correct.

3. All questions are compulsory.

4. There is no negative marking.

5. No electronic device capable of storing and displaying visual information such as calculator and mobile is allowed during the course of the exam.

School Name

Student's Name

Section A (1 Mark Questions)

1. If the area of a circle is $550\,m^2$, then its diameter (in m) is

    (a) 7   (b) $10\sqrt{7}$ (c) $8\sqrt{7}$ (d) 28

2. What is the discount allowed, if a product is sold at ₹ 450 instead of ₹ 650?

    (a) 30.76%   (b) 30.70%   (c) 40.76%   (d) 37.37%

3. If in ΔPQR, $\angle PQR = 5\angle PRQ$ and $\angle QPR = 3\ \angle PRQ$, then $\angle PQR$ is equal to

    (a) 80°   (b) 110°   (c) 100°   (d) 130°

4. If $3a = 5b = 4c$, then $a : b : c$ is equal to

    (a) 7 : 12 : 16   (b) 20 : 7 : 15   (c) 7 : 10 : 9   (d) 20 : 12 : 15

5. Solve the equation and find the value of x.
$$\frac{2x + 3}{3x + 4} = \frac{14}{20}$$

    (a) 1   (b) 2   (c) 5   (d) 7

6. Find the value of 70% of $460 + ?\%$ of $540 = 700$.

    (a) 85   (b) 70   (c) 65   (d) 75

7. By using 3, 8, 7 and 4 digits, find the sum of biggest and smallest number.

    (a) 6993   (b) 12221   (c) 6606   (d) 11221

8. Factorisation of $15y^2 - 26y + 8$ is

    (a) $(3y - 4)(5y - 2)$ (b) $(3y + 4)(5y + 2)$
    (c) $(3y - 4)^2$ (d) $(5y - 2)^2$

9. The sum of $\frac{3}{4}$ th and $\frac{6}{7}$ th part of a number is 63. Find the number.

    (a) $\frac{197}{5}$ (b) $\frac{196}{5}$ (c) 196   (d) 195

10. The interest paid on ₹ 2000 at the rate of 5% simple interest per annum for 6 yr is

    (a) ₹ 2080   (b) ₹ 600   (c) ₹ 496   (d) ₹ 480

11. The value of $\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{169}}}}$ is

    (a) 9   (b) 4   (c) 8   (d) 10

12. What is the least number which when divided by 5, 6, 8, 9 and 12 gives remainder 1 in each case?

    (a) 361   (b) 423   (c) 1806   (d) 3601

02

13. Evaluate : $\dfrac{\sqrt[3]{8} + \sqrt[3]{-27} - \sqrt[3]{343}}{(3)^2 - 8}$

(a) 7   (b) 8   (c) -8 (d) -5

14. Simplify the expression : $[2x - \{3y - (2x - 3y) + (3x - 2y)\} + 2x]$

(a) $x - 4y$ (b) $x + 4$ (c) $3x - 4y$ (d) x

15. $\dfrac{9}{2} \times 2^x - 2^{x-1} = 64$, then find the value of x.

(a) 1   (b) 3   (c) 4   (d) 2

16. By selling a shirt for ₹ 660 a shopkeeper gains 10%. Find the cost price of the shirt.

(a) ₹ 650   (b) ₹ 625   (c) ₹ 600   (d) ₹ 700

17. Evaluate : $(2d^2 g^{-1})^3 \times \left(\dfrac{d^3}{g}\right)^{-2}$

(a) $6g$ (b) $8g$ (c) $6g^{-1}$ (d) $8g^{-1}$

18. What are the values of a and b such that $34a24b$ is the least number to be divisible by 15?

(a) $a = 2$ and $b = 5$ (b) $a = 2$ and $b = 0$ (c) $a = 0$ and $b = 2$ (d) $a = 1$ and $b = 1$

19. If $x + y = 2s$, then $\dfrac{x}{x - s} + \dfrac{s}{y - s} = ?$

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

20. If $\dfrac{x}{y} = \dfrac{2}{3}$ and $\dfrac{y}{z} = \dfrac{4}{5}$, then $\dfrac{x + y}{y + z}$ is equal to

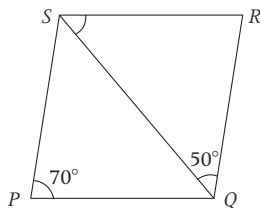(a) $\dfrac{9}{28}$ (b) $\dfrac{27}{20}$ (c) $\dfrac{6}{8}$ (d) $\dfrac{20}{27}$

21. A 4-digit number $8\,xy\,5$ is divisible by 11. What is the value of $x - y$?

(a) 3   (b) -3 (c) 6   (d) -6

22. In final exam of class XI, there were 60 students and out of them 20% students were failed. How many students were passed for class XII?

(a) 40   (b) 45   (c) 47   (d) 48

23. In the given figure, $PQRS$ is a parallelogram in which $\angle QPS = 70°$ and $\angle RQS = 50°$. Then $\angle QSR$ is equal to

(a) 60°   (b) 75°   (c) 45°   (d) 50°

03

24. Geetanjali has 152 more pink flowers than white flowers. After she had used 1/2 of her white flowers and 5/6 of her pink flowers to make a garland, she had the same number of pink and white flowers left. What was the total number of flowers she has at first?

(a) 210   (b) 304   (c) 310   (d) 280

25. What amount will be received on a sum of ₹ 4000 in 2yr at the rate of 20% per annum, if interest is compounded yearly?

(a) ₹ 4862   (b) ₹ 5856   (c) ₹ 5700   (d) ₹ 5760

26. Aman's monthly salary is ₹ 420 and his monthly expenses on travel are ₹ 210. The central angle of the sector representing travel expenses in the pie-chart would be

(a) 150°   (b) 180°   (c) 45°   (d) 60°

27. Multiply $(x^3 - 7x + 8 - 2x^2)$ by $(2x^2 + 3)$

(a) $2x^5 + 8x^4 - 10x^3 + 20x^2 - 42x + 48$
(b) $2x^5 - 8x^4 - 10x^3 + 20x^2 - 42x + 48$
(c) $2x^5 - 8x^4 - 10x^3 + 20x^2 - 42x + 8$
(d) $2x^5 - 4x^4 - 11x^3 + 10x^2 - 21x + 24$

28. A sum of money becomes $\frac{5}{4}$ of itself in 2yr, then rate of interest is

[If interest is calculated as simple interest]

(a) $5\frac{5}{9}\%$ (b) $6\frac{5}{9}\%$

(c) $11\frac{1}{2}\%$ (d) $12\frac{1}{2}\%$

29. Two cubes have their volumes in the ratio 1 : 8. The ratio of their surface areas is

(a) 1 : 3   (b) 1 : 9
(c) 1 : 27   (d) 1 : 4

30. If $y + \frac{1}{y} = \sqrt{7}$, then find the value of $y^4 + \frac{1}{y^4}$.

(a) 5   (b) 49   (c) 23   (d) 25

31. In the given figure, $AB \parallel CD$. If $\angle CAB = 65°$ and $\angle EFC = 40°$, then $\angle CEF$ is equal to


(a) 25°   (b) 55°   (c) 45°   (d) 35°

04
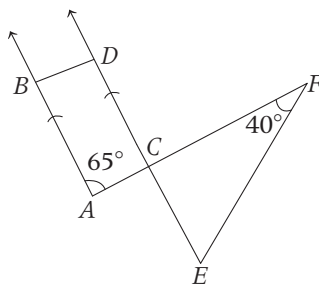
32. What will be the approx amount when the sum ₹ 6000 at the rate of interest of 4% per annum is invested for $1\frac{1}{2}$ yr, if interest is calculated half-yearly?

(a) ₹ 6437   (b) ₹ 6367   (c) ₹ 6791   (d) ₹ 62424

33. Kiran goes to the shop twice. The first time, she takes a ₹100 note and brings back ₹20.98. The second time, she takes ₹50 note and brings back ₹10.39. How much does she spend altogether?

(a) ₹ 31.96   (b) ₹ 150.23
(c) ₹ 30.46   (d) ₹ 118.63

34. A book was sold for ₹ 600 at a profit of 20%. Had it been sold for ₹ 235, then loss percentage would have been

(a) 51%   (b) 57%   (c) 50%   (d) 53%

35. The value of $\dfrac{\left(\frac{1}{2}\right)^5}{\left(\frac{1}{2}\right)^4} \div \dfrac{\left(\frac{1}{8}\right)}{\left(\frac{1}{4}\right)}$ is

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

36. Evaluate : $\left(\sqrt{\dfrac{225}{729}} - \sqrt{\dfrac{25}{144}}\right) \div \sqrt{\dfrac{16}{81}}$

(a) $\dfrac{5}{16}$ (b) $\dfrac{5}{48}$

(c) $\dfrac{3}{16}$ (d) $\dfrac{15}{16}$

37. A solid rectangular piece of iron measures $1.05\,\text{m} \times 70\,\text{cm} \times 1.5\,\text{cm}$. What is the weight of this piece in kg, if $1\,\text{cm}^3$ of iron weight is 8 gm?

(a) 552 kg   (b) 662 kg
(c) 772 gm   (d) 88.2 kg

38. Find the product of square of $-\dfrac{2}{3}$ and the cube of $-\dfrac{3}{2}$.

(a) -1 (b) $-3/2$ (c) $-2/3$ (d) 1

39. If $xy = 6$ and $x + y = 4$, then the value of $(x^2 + y^2)$ is

(a) 4   (b) 3   (c) 2   (d) 5

40. Find the surface area of a cuboid 16 m long, 14 m broad and 7 m high.

(a) $1568\,\text{m}^2$ (b) $868\,\text{m}^2$
(c) $6815\,\text{m}^2$ (d) $688\,\text{m}^2$

05

# Section B (2 Marks Questions)

41. A number consists of two digits whose sum is 8. If 36 is added to the number, its digits are interchanged. The number is

(a) 53   (b) 62   (c) 26   (d) 63

42. A shopkeeper blends two varieties of coffee costing ₹ 18 and ₹ 14 per kg in the ratio of 8 : 5. He sells the blended variety at the rate of ₹ 18.15 per kg. His gain percentage in the transaction is

(a) 10.25%   (b) 14%   (c) 8%   (d) 10%

43. A certain school has 300 students, 142 of whom are boys. It has 30 teachers, 12 of whom are men. What percent of the total number of students and teachers in the school is female?

(a) 58%   (b) $66\frac{2}{3}\%$ (c) 45%   (d) $53\frac{1}{3}\%$

44. If $\dfrac{p}{q} = \dfrac{r}{s} = \dfrac{t}{u} = 3$, then $\dfrac{2p^2 + 3r^2 + 4t^2}{2q^2 + 3s^2 + 4u^2}$ is equal to

(a) 2   (b) 9   (c) 4   (d) 8

45. Bharat's annual income is ₹636000. He spends 22% of his monthly income on paying bills, 18% on household items, 12% on paying his children's fee and 4% he donates to a charity. If three-fifth of the remaining amount he invests in mutual funds, then what is the amount left with him every month?

(a) ₹ 17850   (b) ₹ 12162   (c) ₹ 9328   (d) ₹ 13992

Directions (Q. Nos. 46-48) *Read the following bar graph and answer the questions.*
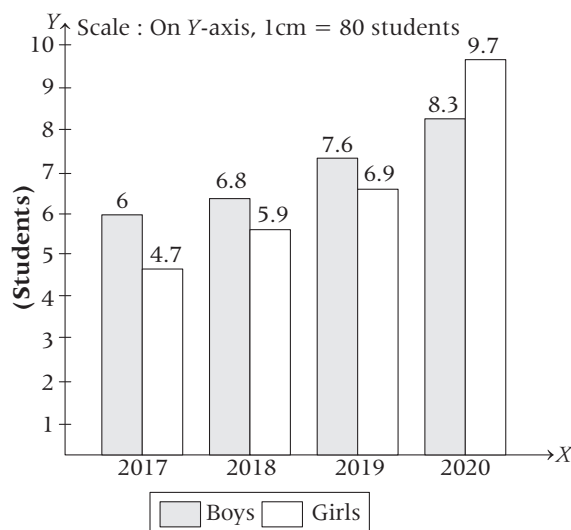
Bar graph of number of boys and number of girls in a school from 2017 to 2020.

06

46. Total number of students in the year 2018 is

(a) 1160   (b) 1016

(c) 1380   (d) 1490

47. Find the minimum difference between the number of boys and girls in any year in the given period.

(a) 48   (b) 70

(c) 50   (d) 56

48. Find the ratio between the number of students in the year 2017 and in 2018.

(a) 13 : 9   (b) 127 : 145

(c) 29 : 36   (d) 107 : 127

49. The area of the trapezium *PQRS* as shown in the figure (in cm^2) is
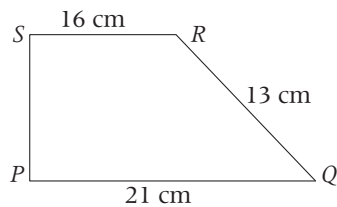
(a) 222   (b) 111

(c) 224   (d) 252

50. If I is the incentre of $\triangle ABC$ and $\angle B = 60°$ and $\angle C = 40°$, then the magnitude of $\angle BIC$ is

(a) 130°   (b) 60°

(c) 120°   (d) 105°

Solutions

1. **(b)** Given,

Area of circle $= 550\ \text{m}^2$

$\Rightarrow \qquad\qquad \pi r^2 = 550 \quad \Rightarrow \quad r^2 = \dfrac{550 \times 7}{22}$

$\Rightarrow \qquad\qquad r^2 = 25 \times 7 \quad \Rightarrow \quad r = 5\sqrt{7}\ \text{m}$

So, diameter $= 2r = 2 \times 5\sqrt{7}\ = 10\sqrt{7}\ \text{m}$

2. **(a)** Given, marked price $= ₹650$

and selling price $= ₹450$

So, discount% $= \dfrac{\text{MP} - \text{SP}}{\text{MP}} \times 100 = \dfrac{650 - 450}{650} \times 100$

$\qquad\qquad = \dfrac{200}{650} \times 100 = 30.76\%$

3. **(c)** According to the question,
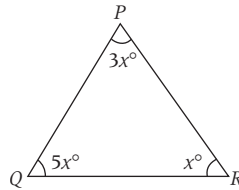
Let $\angle PRQ = x°$, then $\angle PQR = 5x°$ and $\angle QPR = 3x°$

We know that, sum of interior angle of triangle $= 180°$

$\Rightarrow \qquad\qquad\qquad x° + 5x° + 3x° = 180°$

$\Rightarrow \qquad\qquad\qquad\qquad\qquad 9x° = 180°$

$\Rightarrow \qquad\qquad\qquad\qquad\qquad x° = 20°$

So, $\qquad\qquad \angle PQR = 5x° = 5 \times 20° = 100°$

4. **(d)** Let, $3a = 5b = 4c = m$

$\Rightarrow \qquad\qquad a = \dfrac{m}{3}; b = \dfrac{m}{5}; c = \dfrac{m}{4}$

So, $\qquad a : b : c = \dfrac{m}{3} : \dfrac{m}{5} : \dfrac{m}{4} = 20 : 12 : 15$

5. **(b)** Given,

$$\dfrac{2x+3}{3x+4} = \dfrac{14}{20}$$

$\Rightarrow \qquad\qquad\qquad \dfrac{2x+3}{3x+4} = \dfrac{7}{10}$

$\Rightarrow \qquad\qquad 20x + 30 = 21x + 28 \quad \Rightarrow \quad 21x - 20x = 30 - 28$

8

$$\therefore \qquad\qquad x = 2$$

6. (b) Given, 70% of $460 + ?\%$ of $540 = 700$

$$\Rightarrow \qquad \frac{70}{100} \times 460 + \frac{?}{100} \times 540 = 700$$

$$\Rightarrow \qquad 322 + \frac{54}{10} \times ? = 700 \Rightarrow \frac{54}{10} \times ? = 378$$

$$\therefore \qquad ? = \frac{378 \times 10}{54} = 70$$

7. (b) Given, numbers are 3, 8, 7 and 4.

To obtain the smallest number we write the given digits in ascending order and to obtain the biggest number we write the given digits in descending order.

Then, the smallest number from these digits $= 3478$

and   the biggest number from these digits $= 8743$

$$\therefore \qquad\text{Required sum} = 3478 + 8743 = 12221$$

8. (a) Given, $15y^2 - 26y + 8 = 15y^2 - 20y - 6y + 8 = 5y(3y - 4) - 2(3y - 4) = (5y - 2)(3y - 4)$.

9. (b) Let the number be x.

Then, $\dfrac{3}{4}$ th part of number $= \dfrac{3}{4} \times x = \dfrac{3x}{4}$ and $\dfrac{6}{7}$ th part of number $= \dfrac{6}{7} \times x = \dfrac{6x}{7}$

According to the question,

$$\frac{3x}{4} + \frac{6x}{7} = 63$$

$$\Rightarrow \qquad \frac{21x + 24x}{28} = 63 \Rightarrow 45x = 63 \times 28$$

$$\therefore \qquad x = \frac{63 \times 28}{45} = \frac{196}{5}$$

$$\therefore \text{ Required number} = \frac{196}{5}$$

10. (b) Given,

Principal amount $(P) = ₹2000$

Rate of interest $(R) = 5\%$ per annum and time $(T) = 6$ yr

We know that, Simple Interest $(SI) = \dfrac{P \times R \times T}{100} = \dfrac{2000 \times 5 \times 6}{100} = ₹600$

11. (b) Given, $\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{169}}}} = \sqrt{10 + \sqrt{25 + \sqrt{108 + 13}}} = \sqrt{10 + \sqrt{25 + \sqrt{121}}}$

$$= \sqrt{10 + \sqrt{25 + 11}} = \sqrt{10 + \sqrt{36}}$$

$$= \sqrt{10 + 6} = \sqrt{16} = 4$$

12. (a) According to the question,

Rough work

2	5, 6, 8, 9, 12
2	5, 3, 4, 9, 6
2	5, 3, 2, 9, 3
3	5, 3, 1, 9, 3
3	5, 1, 1, 3, 1
5	5, 1, 1, 1, 1
	1, 1, 1, 1, 1

9

Required number = [LCM of (5, 6, 8, 9 and 12)] + 1

$$= 360 + 1 = 361$$

13. (c) Given, $\dfrac{\sqrt[3]{8} + \sqrt[3]{-27} - \sqrt[3]{343}}{(3)^2 - 8} = \dfrac{2 + (-3) - 7}{9 - 8} = \dfrac{-8}{1} = -8$

14. (c) Given, $[2x - \{3y - (2x - 3y) + (3x - 2y)\} + 2x]$

$$= [2x - \{3y - 2x + 3y + 3x - 2y\} + 2x]$$

$$= [2x - \{4y + x\} + 2x] = 2x - 4y - x + 2x = 3x - 4y$$

15. (c) Given,

$$\frac{9}{2} \times 2^x - 2^{x-1} = 64$$

$\Rightarrow \qquad 9 \times 2^{x-1} - 2^{x-1} = 64$

$\Rightarrow \qquad 2^{x-1}(9 - 1) = 64$

$\Rightarrow \qquad 2^{x-1} = \dfrac{64}{8} = 8$

$\Rightarrow \qquad 2^{x-1} = 2^3$

$\Rightarrow \qquad x - 1 = 3 \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ [on comparing]

$\therefore \qquad\qquad x = 4$

16. (c) Given, selling price of shirt = ₹660

Gain % = 10%

We know that, $\text{CP} = \left(\dfrac{100}{100 + \text{Gain\%}}\right) \times \text{SP}$

$$= \left(\dfrac{100}{100 + 10}\right) \times 660 = \dfrac{100}{110} \times 660 = ₹600$$

17. (d) Given, $(2d^2 g^{-1})^3 \times \left(\dfrac{d^3}{g}\right)^{-2} = \left(\dfrac{2d^2}{g}\right)^3 \times \left(\dfrac{g}{d^3}\right)^2 = \dfrac{8d^6}{g^3} \times \dfrac{g^2}{d^6} = \dfrac{8}{g} = 8g^{-1}$

18. (b) For divisibility by 15, the given number must be divisible by 3 and 5 both.

For divisible by 5, unit digit is either 0 or 5.

$\therefore \quad b = 0$ or 5

Now, for divisible by 3, sum of all digits must be divisible by 3.

Let $b = 0$

Then, $3 + 4 + a + 2 + 4 + 0 = 13 + a \Rightarrow a$ must be 2.

and let $b = 5$

Then, $3 + 4 + a + 2 + 4 + 5 = 18 + a \Rightarrow a$ must be 0.

Therefore, there are two numbers 340245 and 342240.

10

Since, $a = 0$ and $b = 5$ is not any option.

So, $a = 2$ and $b = 0$ is the correct answer.

19. **(b)** Given, $\qquad x + y = 2s$

Then, $\qquad\qquad x = 2s - y$ $\qquad\qquad\qquad\qquad\qquad\qquad$ ... (i)

So, $\quad \dfrac{x}{x-s} + \dfrac{s}{y-s} = \dfrac{2s-y}{2s-y-s} + \dfrac{s}{y-s}$ $\qquad\qquad\qquad$ [from Eq. (i)]

$$= \dfrac{2s-y}{s-y} - \dfrac{s}{s-y} = \dfrac{2s-y-s}{s-y} = \dfrac{s-y}{s-y} = 1$$

20. **(d)** Given, $\dfrac{x}{y} = \dfrac{2}{3}$ and $\dfrac{y}{z} = \dfrac{4}{5}$

So, $\quad \dfrac{x+y}{y+z} = \dfrac{y\left(\dfrac{x}{y}+1\right)}{y\left(1+\dfrac{z}{y}\right)} = \dfrac{\left(\dfrac{x}{y}+1\right)}{\left(1+\dfrac{z}{y}\right)} = \dfrac{\left(\dfrac{2}{3}+1\right)}{\left(1+\dfrac{5}{4}\right)} = \dfrac{\left(\dfrac{2+3}{3}\right)}{\left(\dfrac{4+5}{4}\right)} = \dfrac{\left(\dfrac{5}{3}\right)}{\left(\dfrac{9}{4}\right)} = \dfrac{4\times5}{3\times9} = \dfrac{20}{27}$

21. **(a)** We know that, if the difference between the sum of digits at even places and sum of digits at odd places is 0 or a multiple of 11, then the number is divisible by 11.

Given number $= 8\,x\,y\,5$

Then, $\qquad\qquad\qquad (8+y) - (x+5) = 0$

$\Rightarrow \qquad\qquad\qquad 8 + y - x - 5 = 0$

$\Rightarrow \qquad\qquad\qquad\qquad y - x + 3 = 0$

$\Rightarrow \qquad\qquad\qquad\qquad x - y - 3 = 0$

$\therefore \qquad\qquad\qquad\qquad\quad x - y = 3$

22. **(d)** Given, total students $= 60$

Percentage of failed students $= 20\%$

So, students passed for class XII $= (100 - 20)\%$ of $60 = \dfrac{80}{100} \times 60 = 48$

23. **(a)** In the given parallelogram,

$\qquad\qquad\qquad \angle P = \angle R = 70°$ $\qquad$ [opposite angles of a parallelogram are equal]

In $\triangle QRS$,

$\qquad\qquad \angle RQS + \angle QRS + \angle QSR = 180°$ $\qquad$ [$\because$ Sum of interior angle of triangle]

$\Rightarrow \qquad\qquad 50° + 70° + \angle QSR = 180°$

$\Rightarrow \qquad\qquad\quad 120° + \angle QSR = 180°$

$\therefore \qquad\qquad\qquad\qquad \angle QSR = 180° - 120° = 60°$

24. **(b)** Let the total number of white flowers she has initially be x.

Then, number of pink flowers $= x + 152$

11

According to the question,

$$x - \frac{x}{2} = (x + 152) - \frac{5}{6}(x + 152)$$

$$\Rightarrow \qquad \frac{x}{2} = \frac{(x + 152)}{6}$$

$$\Rightarrow \qquad 6x = 2x + 304$$

$$\Rightarrow \qquad 6x - 2x = 304$$

$$\Rightarrow \qquad 4x = 304$$

$$\Rightarrow \qquad x = \frac{304}{4} = 76$$

$\therefore$ **Total number of flowers she has initially** $= x + x + 152 = 2x + 152$

$$= 2 \times 76 + 152 = 152 + 152 = 304$$

25. (d) Given, Principle amount $(P) = ₹ 4000$

Time $(n) = 2$ yr

and Rate of interest $(r) = 20\%$ per annum

We know that, Amount $(A) = P\left(1 + \dfrac{r}{100}\right)^n$

$$= 4000\left(1 + \frac{20}{100}\right)^2 = 4000 \times \frac{6}{5} \times \frac{6}{5} = ₹ 5760$$

26. (b) Given, Monthly salary $= ₹ 420$

and travelling expenses $= ₹ 210$

So, Central angle $= \dfrac{\text{Travel expenses}}{\text{Total value}} \times 360° = \dfrac{210}{420} \times 360° = 180°$

27. (d) Given, $(x^3 - 7x + 8 - 2x^2) \times (2x^2 + 3)$

$$= (x^3 - 7x + 8 - 2x^2) \times 2x^2 + (x^3 - 7x + 8 - 2x^2) \times 3$$

$$= 2x^5 - 14x^3 + 16x^2 - 4x^4 + 3x^3 - 21x + 24 - 6x^2$$

$$= 2x^5 - 4x^4 - 11x^3 + 10x^2 - 21x + 24$$

28. (d) Let the sum be $₹ P$ and rate of interest be $R\%$ per annum.

Given, $A = ₹ \dfrac{5}{4}P$

Then, $SI = \dfrac{5}{4}P - P = ₹ \dfrac{P}{4}$

We know that, $SI = \dfrac{P \times R \times T}{100}$

$$\Rightarrow \qquad \frac{P}{4} = \frac{P \times R \times 2}{100}$$

12

$$\therefore \qquad R = 12\frac{1}{2}\%$$

29. (d) According to the question, Edge of the 1st cube $= 1$

and $\qquad$ Edge of the 2nd cube $= (8)^{1/3} = 2$

So, ratio of their surface areas $= \dfrac{6 \times (1)^2}{6 \times (2)^2} = \dfrac{6}{24} = \dfrac{1}{4} = 1 : 4$

30. (c) Given, $y + \dfrac{1}{y} = \sqrt{7}$

Now, squaring on both sides, we get

$$\left(y + \frac{1}{y}\right)^2 = (\sqrt{7})^2 \Rightarrow y^2 + \frac{1}{y^2} + 2 = 7 \Rightarrow y^2 + \frac{1}{y^2} = 5$$

Now, again squaring on both sides, we get

$$\left(y^2 + \frac{1}{y^2}\right)^2 = (5)^2 \Rightarrow y^4 + \frac{1}{y^4} + 2 = 25$$

$$\therefore \qquad y^4 + \frac{1}{y^4} = 23$$

31. (a) Let, $\angle CEF = x^\circ$

Given, $AB \parallel CD$, then AF is a transversal.

$\Rightarrow \qquad \angle DCF = \angle CAB = 65^\circ \qquad\qquad$ [corresponding angles]

In $\triangle CFE$, side EC is produced to D.

$\Rightarrow \qquad x + 40^\circ = 65^\circ$

$\qquad\qquad$ [$\because$ exterior angle is equal to sum of interior opposite angles]

$\therefore \qquad x = 65^\circ - 40^\circ = 25^\circ$

32. (b) Given, $P = ₹6000$

$$r = \frac{4}{2} = 2\% \text{ half-yearly}$$

$$n = \frac{3}{2} \times 2 = 3 \text{ half-yearly}$$

So, $\qquad A = P\left(1 + \dfrac{r}{100}\right)^n = 6000\left(1 + \dfrac{2}{100}\right)^3$

$$= 6000\left(\frac{51}{50}\right)^3 = \frac{6000 \times 51 \times 51 \times 51}{50 \times 50 \times 50} = 6367.24 \simeq ₹6367$$

33. (d) According to the question,

Total spend altogether $= (100 - 20.98) + (50 - 10.39) = 79.02 + 39.61 = ₹118.63$

34. (d) Let the CP of the book $= ₹x$

13

Given, SP of the book $= ₹600$

Then, $$CP = \left(\frac{100}{100 + \text{Profit\%}}\right) \times SP \Rightarrow x = \left(\frac{100}{100 + 20}\right) \times 600$$

$$\Rightarrow \qquad x = \frac{100}{120} \times 600 = 500 \Rightarrow CP = ₹500$$

Now, new $SP = ₹235$

then,   loss $= 500 - 235 = ₹265$

So,   loss% $= \dfrac{265}{500} \times 100 = 53\%$

35. (c) Given, $\dfrac{\left(\frac{1}{2}\right)^5 \cdot \left(\frac{1}{8}\right)}{\left(\frac{1}{2}\right)^4 \cdot \left(\frac{1}{4}\right)} = \left(\frac{1}{2}\right)^{5-4} \div \left(\frac{1}{2^3}\right) \times \left(\frac{1}{2^{-2}}\right) = \left(\frac{1}{2}\right)^1 \div \left(\frac{1}{2}\right) = \left(\frac{1}{2}\right) \times \left(\frac{2}{1}\right) = 1$

36. (a) Given, $\left(\sqrt{\dfrac{225}{729}} - \sqrt{\dfrac{25}{144}}\right) \div \sqrt{\dfrac{16}{81}} = \left[\dfrac{15}{27} - \dfrac{5}{12}\right] \div \dfrac{4}{9} = \left[\dfrac{5}{9} - \dfrac{5}{12}\right] \div \dfrac{4}{9} = \left[\dfrac{20 - 15}{36}\right] \div \dfrac{4}{9}$

$$= \dfrac{5}{36} \div \dfrac{4}{9} = \dfrac{5}{36} \times \dfrac{9}{4} = \dfrac{5}{16}$$

37. (d) Given, $l = 1.05\,\text{m} = (1.05 \times 100)\,\text{cm} = 105\,\text{cm}$

$b = 70\,\text{cm}$ and $h = 1.5\,\text{cm}$

Now, the volume of solid rectangular piece $= lbh$

$$= 105 \times 70 \times 1.5 = 11025\,\text{cm}^3$$

Given, $$1\,\text{cm}^3 = 8\,\text{gm}$$

So, $$11025\,\text{cm}^3 = 8 \times 11025\,\text{gm} = 88200\,\text{gm}$$

Hence, $$\text{weight in kg} = \frac{88200}{1000} = 88.2\,\text{kg} \qquad [\because 1\,\text{kg} = 1000\,\text{gm}]$$

38. (b) According to the question,

square of $\left(-\dfrac{2}{3}\right) = \left(-\dfrac{2}{3}\right)^2 = \dfrac{4}{9}$ and cube of $\left(-\dfrac{3}{2}\right) = \left(-\dfrac{3}{2}\right)^3 = \dfrac{-27}{8}$

So, required product $= \dfrac{4}{9} \times \left(\dfrac{-27}{8}\right) = \dfrac{-3}{2}$

39. (a) Given, $xy = 6$ and $x + y = 4$

We know that, $(x + y)^2 = x^2 + y^2 + 2xy$

$$\Rightarrow \qquad (4)^2 = x^2 + y^2 + 2 \times 6$$

$$\therefore \qquad x^2 + y^2 = 16 - 12 = 4$$

40. (b) Given, $l = 16\,\text{m}; b = 14\,\text{m}; h = 7\,\text{m}$

14

We know that, surface area of cuboid $= 2\,(lb + bh + hl)$

$$= 2\,[16 \times 14 + 14 \times 7 + 7 \times 16]$$

$$= 2\,[224 + 98 + 112] = 2 \times 434 = 868\ \text{m}^2$$

41. (c) Let the number in unit's place be x.

and number in ten's place $= (8 - x)$

Then, original number $= 10\,(8 - x) + x = (80 - 9x)$

If the number is reversed, then it becomes, $10x + 8 - x = (8 + 9x)$

According to the question, $80 - 9x + 36 = 8 + 9x$

$\Rightarrow$ $\qquad\qquad 80 - 8 + 36 = 9x + 9x$

$\Rightarrow$ $\qquad\qquad 18x = 108 \ \Rightarrow\ x = 6$

So, original number $= 80 - 9x = 80 - 54 = 26$

42. (a) Let the quantities of two types of coffee be $8x$ kg and $5x$ kg respectively.

Then, CP of coffee $= ₹\,(18 \times 8x + 14 \times 5x) = ₹\,144x + ₹\,70x = ₹\,214x$

and SP of coffee $= 18.15 \times 13x = ₹\,235.95x$

We know that, Gain% $= \dfrac{\text{SP} - \text{CP}}{\text{CP}} \times 100 = \dfrac{(235.95 - 214)x}{214x} \times 100 = \dfrac{21.95}{214} \times 100 = 10.25\%$

43. (d) In a school, number of students $= 300$

Number of boys $= 142$

Number of girls $= 300 - 142 = 158$

In a school, number of teachers $= 30$

Number of male teachers $= 12$

Number of female teachers $= 30 - 12 = 18$

Total number of students and teachers $= 300 + 30 = 330$

Total number of females in the school $= 158 + 18 = 176$

So, percentage of female in the school $= (176 / 330) \times 100 = 160 / 3\% = 53\dfrac{1}{3}\%$

Hence, total $53\dfrac{1}{3}\%$ are females in the school.

44. (b) Given, $\qquad\qquad \dfrac{p}{q} = \dfrac{r}{s} = \dfrac{t}{u} = 3$

Then, $\qquad\qquad \dfrac{p}{q} = 3 \ \Rightarrow\ p = 3q;$

$\qquad\qquad \dfrac{r}{s} = 3 \Rightarrow r = 3s; \qquad$ and $\qquad \dfrac{t}{u} = 3 \Rightarrow t = 3u$

$\therefore \qquad \dfrac{2p^2 + 3r^2 + 4t^2}{2q^2 + 3s^2 + 4u^2} = \dfrac{2 \times (3q)^2 + 3 \times (3s)^2 + 4 \times (3u)^2}{2q^2 + 3s^2 + 4u^2}$

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$$= \frac{18q^2 + 27s^2 + 36u^2}{2q^2 + 3s^2 + 4u^2} = \frac{9(2q^2 + 3s^2 + 4u^2)}{(2q^2 + 3s^2 + 4u^2)} = 9$$

45. (d) Given, Bharat's annual income = ₹ 636000

Then, his monthly income $= \frac{636000}{12} = $ ₹ 53000

According to the question,

Amount left after all expenses every month $= [53000 - \{(22 + 18 + 12 + 4)\% \text{ of } 53000\}] \times \frac{3}{5}$

$$= \left[53000 - \frac{56}{100} \times 53000 \right] \times \frac{3}{5}$$

$$= (53000 - 29680) \times \frac{3}{5}$$

$$= 23320 \times \frac{3}{5} = ₹ 13992$$

46. (b) Total number of students in 2018 = Number of boys in 2018 + Number of girls in 2018

$$= 6.8 + 5.9 = 12.7$$

Given, 1 cm = 80 students

So, 12.7 cm $= 80 \times 12.7$ students = 1016 students

47. (d) According to the given bar graph, minimum difference between number of boys and girls is in year 2019.

i.e. $7.6 - 6.9 = 0.7$ cm

Given, 1 cm = 80 students

So, 0.7 cm $= 0.7 \times 80 = 56$ students

48. (d) Total number of students in 2017 $= 6 + 4.7 = 10.7$ cm $= 10.7 \times 80$

and total number of students in 2018 $= 6.8 + 5.9 = 12.7$ cm $= 12.7 \times 80$

So, required ratio $= \frac{10.7 \times 80}{12.7 \times 80} = \frac{107}{127} = 107 : 127$
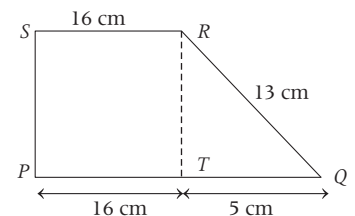
49. (a) Since, $PQ \| SR$

Then, $PT = SR = 16$ cm   and $QT = 5$ cm
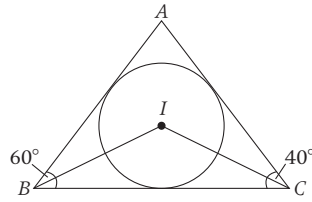
In $\triangle QRT$, $(RT)^2 + (TQ)^2 = (QR)^2$

$\Rightarrow$ $(RT)^2 + (5)^2 = (13)^2$ $\Rightarrow$ $(RT)^2 = 169 - 25$

$\Rightarrow$ $(RT)^2 = 144$ $\Rightarrow$ $RT = 12$ cm

So, area of trapezium $= \frac{1}{2} \times$ (sum of parallel sides) $\times$ height

$$= \frac{1}{2} \times (16 + 21) \times 12 = 37 \times 6 = 222 \text{ cm}^2$$

16

50. (a) According to the question,

Given,	$\angle B = 60°$ and $\angle C = 40°$	
Now, In $\triangle BIC$	$\angle IBC = \dfrac{1}{2} \angle B = \dfrac{1}{2} \times 60°$	$[\because BI$ is bisector of $\angle B]$
	$= 30°$	
and	$\angle ICB = \dfrac{1}{2} \angle C = \dfrac{1}{2} \times 40°$	$[\because CI$ is bisector of $\angle C]$
	$= 20°$	
Then,	$\angle BIC + \angle IBC + \angle ICB = 180°$	$[\because$ Sum of interior angles of triangle is 180°$]$
	$\angle BIC + 30° + 20° = 180°$	
$\Rightarrow$	$\angle BIC + 50° = 180°$	
$\therefore$	$\angle BIC = 130°$	