

CBSE Board
Class VIII Mathematics

Time: 2 ½ hours

Total Marks: 80

General Instructions:

1. All questions are **compulsory**.
 2. **Section A** comprises of **12** questions carrying 1 mark each.
 3. **Section B** comprises of **12** questions carrying 2 marks each.
 4. **Section C** comprises of **8** questions carrying 3 marks each.
 5. **Section D** comprises of **5** questions carrying 4 marks each.
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Section A
(Questions 1 to 12 carry 1 mark each)

1. Find the cube root of 1000.
A. 10.1
B. 10
C. 1
D. 101
2. What is the number of faces in a hexagonal prism?
A. 6
B. 8
C. 9
D. 10
3. Square root of 484 is given by which of the options listed below?
A. 21
B. 42
C. 22
D. 32
4. Area of a square is 49 cm². Find its perimeter.
A. 35 cm
B. 14 cm
C. 30 cm
D. 28 cm

5. Multiplicative inverse of $2\frac{2}{3}$ is ____ .
- A. $\frac{8}{3}$
B. $-\frac{8}{3}$
C. $\frac{3}{8}$
D. 1
6. Janhavi types 480 words in 15 minutes. How many words would she type in 5 minutes?
- A. 140
B. 150
C. 160
D. 170
7. If $\frac{6k + 17}{k} = \frac{29}{2}$, then
- A. 2
B. 3
C. 4
D. 5
8. What is the greatest common factor of expressions $3x^2y^3$, $10x^3y^2$ and $6x^2y^2z$?
- A. $30x^3y^2z$
B. $3x^2y^2z$
C. x^3y^2z
D. x^2y^2
9. A sector is drawn as $\frac{1}{4}$ th part of a circle. The central angle made by it is
- A. 90°
B. 55°
C. 45°
D. 40°
10. $a^2 - 2ab + b^2$
- A. $(a - 2b)^2$
B. $(a - b)^3$
C. $(a - b)^2$
D. $(a + b)^2$

11. Which of the following points lie on the graph of "y = x"?
- A. (1, 2)
 - B. (2, 1)
 - C. (2, 2)
 - D. (0, 1)
12. Which of the following number is divisible by 5 and 10 both?
- A. 45
 - B. 405
 - C. 450
 - D. 412

Section B

(Questions 13 to 24 carry 2 marks each)

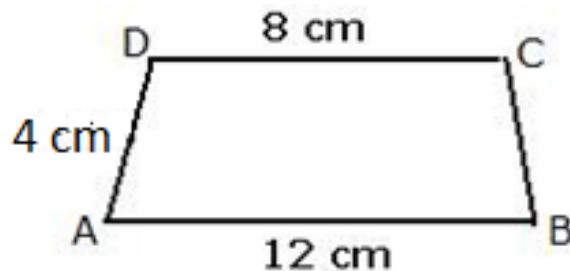
13. Using law of exponents, express each of the following as a rational number with positive exponents:

(i) $(2^5 \div 2^8) \times 2^{-7}$

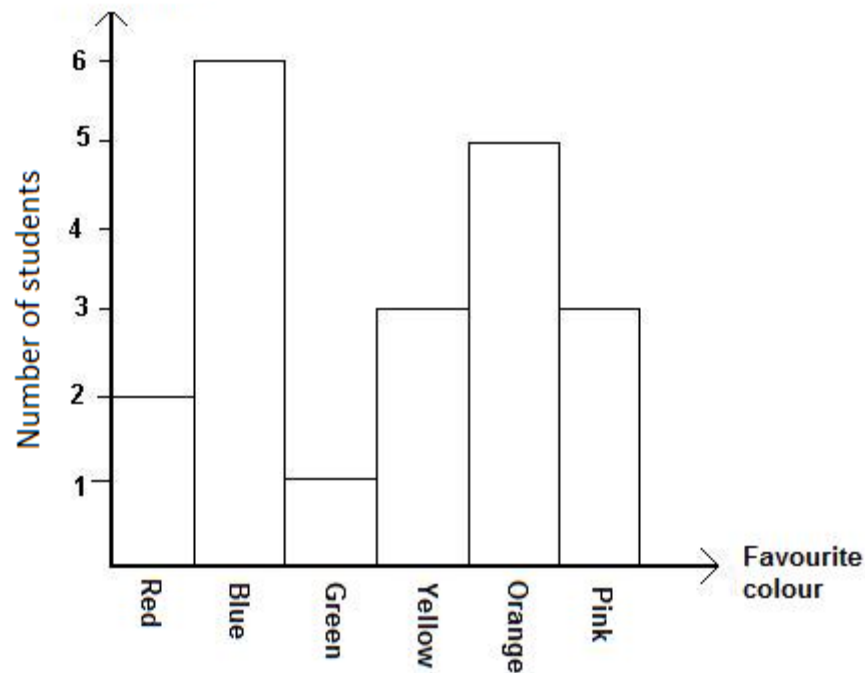
(ii) $\left[\left(\frac{3}{2}\right)^{-2}\right]^3$

14. Which of the following numbers are divisible by 4?
- (i) 45748
 - (ii) 21404

15. The following quadrilateral is an isosceles trapezoidal. Find its perimeter.



16. The given bar graph shows the favourite colours of 20 students in a class. How many more students favour orange colour than green colour?



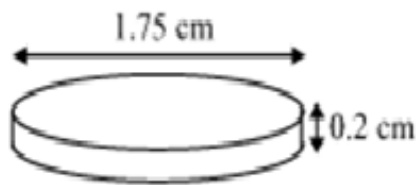
17. Divide 64 into two parts such that three times the greater part will be equal to five times the smaller one.
18. In a collection of 35 lotteries, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?
19. Verify the identity $(a + b)^2 = a^2 + 2ab + b^2$; for $a = 3$ and $b = -4$.
20. Write the following numbers in generalized form.
(i) 45
(ii) 123
21. Find the height of cuboid whose volume is 800 cm^3 , length is 20 cm and breadth is 10 cm.
22. In the following table, does x and y vary directly with each other?

x	5	7	9	11
y	15	21	36	33

23. If 6x pens cost Rs $12x^2 - 36x$, find the cost of one pen.
24. A polyhedron is having 8 vertices and 12 edges. Find the number of faces in this polyhedron.

Section C
(Questions 25 to 32 carry 3 marks each)

25. A's income is 60% more than that of B. By what percent is B's income less than A's?
26. Find the cube root of 5.832.
27. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboids of dimensions $5.5 \text{ cm} \times 10 \text{ cm} \times 3.5 \text{ cm}$?



28. Two angles of a quadrilateral are of measures 75° each and the other two angles are equal. What is the measure of either of these two equal angles?
29. Simplify: $(5 - x)(6 - 5x)(2 - x)$
30. What is Euler's formula? Verify the Euler's formula for a pentagonal prism.
31. A pair of jeans is marked down 30% and then is reduced at the cash register by another 10%. Is this a total reduction of 40%? Give reasons.
32. Simplify.
- (i) $x^0 \times y^0 \times z^0$
 - (ii) $\frac{(x^0 + y^0) \times 2^5}{2^4}$
 - (iii) $(4^6)^7$
- $$\frac{a^2 \times a^3 \times b^3 \times b^4}{a^5 \times b^2}$$

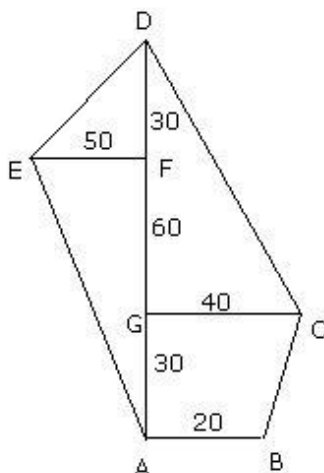
Section D
(Questions 33 to 37 carry 4 marks each)

33. The monthly income of a family is Rs. 15000. The monthly expenditure of the family on various items is given below.

Items	Education	Rent	Food	Clothing	Savings
Expenditure (in Rs.)	2000	3500	6000	2500	1000

Represent the above data using a pie diagram.

34. Mrs. Valdez and Mrs. Kim took polls of their second-grade classes to find their students' favourite colors. In Mrs. Valdez's class, 14 students said their favorite colour was blue and 6 said their favorite color was red. In Mrs. Kim's class, 8 voted for blue and 5 for red. Whose class had a higher ratio of students who preferred blue to students who preferred red?
35. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8g mass. (Use $\pi = 3.14$)
36. The cost of 6 balls is Rs. 42. What would be the cost of 10 balls, 15 balls and 20 balls? Write them in the form of a table.
37. Find the area of following polygon, all dimensions are in meters.



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Class VIII Mathematics
Solution

Time: 2 ½ hours

Total Marks: 80

Section A

1. Correct option: B

$$\sqrt[3]{1000} = \sqrt[3]{5 \times 2 \times 5 \times 2 \times 5 \times 2} = \sqrt[3]{5^3 \times 2^3} = 5 \times 2 = 10$$

2. Correct option: B

For a hexagonal prism, $V = 12$, $E = 18$

Applying Euler's formula: $F + V - E = 2$

$$F = 2 + E - V = 2 + 18 - 12 = 8$$

3. Correct option: C

$$\sqrt{484} = \sqrt{2 \times 2 \times 11 \times 11} = \sqrt{2^2 \times 11^2} = 2 \times 11 = 22$$

4. Correct option: D

$$\text{Area of square} = 49 \text{ cm}^2 = 7^2 \text{ cm}^2$$

Therefore, side of square is $= 7 \text{ cm}$

$$\text{So the perimeter of square} = 7 \times 4 = 28 \text{ cm}$$

5. Correct answer: C

$$2\frac{2}{3} = \frac{8}{3}$$

Thus, the multiplicative inverse of $2\frac{2}{3}$ is $\frac{3}{8}$.

6. Correct option: C

$$\frac{480}{x} = \frac{15}{5}$$

$$\Rightarrow x = \frac{480 \times 5}{15} = 160$$

7. Correct option: A

$$\frac{6k+17}{k} = \frac{29}{2}$$

$$\Rightarrow 12k + 34 = 29k$$

$$\Rightarrow 17k = 34 \Rightarrow k = 2$$

8. Correct option: D

Each of the three expressions are with minimum power of x is 2; power of y is 2 and no power of z, so the greatest common factor of the three expressions is x^2y^2 .

9. Correct answer: A

$$\text{Central angle} = \frac{\text{Value of component}}{\text{Total value}} \times 360^\circ = \frac{1}{4} \times 360^\circ = 90^\circ$$

10. Correct answer: C

$$a^2 - 2ab + b^2 = a^2 - ab - ab + b^2 = a(a - b) - b(a - b) = (a - b)^2$$

11. Correct answer: C

(2, 2) lies on the graph of $y = x$ as $x = 2$ and $y = 2$ i.e., $x = y$

12. Correct answer: C

If the unit place of a number is zero then it is divisible by both 5 and 10.

Section B

13.

(i)

$$\begin{aligned} (2^5 \div 2^8) \times 2^{-7} &= (2^{5-8}) \times 2^{-7} \\ &= 2^{-3} \times 2^{-7} \\ &= 2^{-3+(-7)} \\ &= 2^{-10} \\ &= \frac{1}{2^{10}} \end{aligned}$$

(ii)

$$\begin{aligned} \left[\left(\frac{3}{2} \right)^{-2} \right]^3 &= \left(\frac{3}{2} \right)^{-2 \times 3} \\ &= \left(\frac{3}{2} \right)^{-6} \\ &= \left(\frac{2}{3} \right)^6 \end{aligned}$$

- 14.** A number is divisible by 4 if the number formed by its last two digits is divisible by 4.

(i) Consider 45748

Number formed by last two digits is 48.

48 is divisible by 4.

Hence, 45748 is also divisible by 4.

(ii) Consider 21404

Number formed by last two digits is 04.

Now, 04 is divisible by 4.

Hence, 21404 is also divisible by 4.

- 15.** Since ABCD is an isosceles trapezoidal, we have $AD = BC$.

Therefore, $AD = BC = 4$ cm.

Now the perimeter of given trapezium = $AB + BC + CD + DA$

$$= 12 + 4 + 8 + 4 = 28$$

Hence, the perimeter of the given trapezium is 28 cm.

- 16.** From the graph, it is clear that 5 students favoured orange and 1 student favoured green.

$$\text{Now, } 5 - 1 = 4$$

Therefore, 4 more students favoured orange colour than green.

- 17.** Let x be the greater part.

Then, $64 - x$ is the smaller part.

Now, according to condition given,

$$3x = 5(64 - x)$$

$$3x = 320 - 5x$$

$$3x + 5x = 320$$

$$8x = 320$$

$$x = 40$$

Hence, the two parts are 40 and 24.

- 18.** Here,

$$\text{Total number of outcomes} = 10 + 25 = 35$$

Let E be the event of getting a prize.

$$\text{Number of outcomes favourable to event } E = 10$$

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{10}{35} = \frac{2}{7}$$

$$\text{Probability of getting a prize} = \frac{2}{7}$$

19. $(a + b)^2 = a^2 + 2ab + b^2$

Here, $a = 3$ and $b = -4$

$$\text{LHS} = (a + b)^2 = (3 - 4)^2 = (-1)^2 = 1$$

$$\begin{aligned}\text{RHS} &= a^2 + 2ab + b^2 \\ &= (3)^2 + 2(3)(-4) + (-4)^2 \\ &= 9 - 24 + 16 \\ &= 1\end{aligned}$$

20. The generalized form is as below:

(i) $45 = 40 + 5$

$$= 4 \times 10 + 5 \times 1$$

(ii) $123 = 100 + 20 + 3$

$$= 1 \times 100 + 2 \times 10 + 3 \times 1$$

21. Since, volume of cuboid = $l \times b \times h$

Here, $V = 800 \text{ cm}^3$, $l = 20 \text{ cm}$ and $b = 10 \text{ cm}$

$$\Rightarrow 800 = 20 \times 10 \times h$$

$$\Rightarrow 800 = 200 \times h$$

$$\Rightarrow h = \frac{800}{200} = 4 \text{ cm}$$

22. We know that two quantities x and y vary directly if the ratio $\frac{x}{y}$ remains constant, so

we find the ratio in each case.

x	5	7	9	11
y	15	21	36	33
Ratio $\frac{x}{y}$	$\frac{x}{y} = \frac{5}{15} = \frac{1}{3}$	$\frac{x}{y} = \frac{7}{21} = \frac{1}{3}$	$\frac{x}{y} = \frac{9}{36} = \frac{1}{4}$	$\frac{x}{y} = \frac{11}{33} = \frac{1}{3}$

Clearly, the ratio $\frac{x}{y}$ is not same for all the cases.

Thus, x and y are not varying directly.

23.

1.

$$\begin{aligned}\text{Cost of 1 pen} &= \frac{12x^2 - 36x}{6x} \\ &= \frac{12x^2}{6x} - \frac{36x}{6x} \\ &= 2x - 6\end{aligned}$$

Hence, the cost of one pen is Rs. $(2x - 6)$.

24. Number of vertices (V) = 8
 Number of edges (E) = 12
 Let, number of faces = F
 Since every polyhedron satisfy Euler's formula, therefore
 $F + V = E + 2$
 Or, $F + 8 = 12 + 2$
 Or, $F = 14 - 8 = 6$
 Hence, the number of faces is 6.

Section C

25. Let B's income be Rs. 100.
 Then, A's income = Rs. 160
 If A's income is Rs. 160, then B's income = Rs. 100.
 If A's income is Rs 100, then B's income = Rs. $\left(\frac{100}{160} \times 100\right)$ = Rs. 62.50
 Therefore, B's income is less than A's income by $(100 - 62.50)\%$, i.e. by 37.5%.

26. Converting 5.832 into fraction, we get $\frac{5832}{1000}$

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Now,

$$\begin{aligned}
 & \sqrt[3]{\frac{5832}{1000}} \\
 &= \frac{\sqrt[3]{5832}}{\sqrt[3]{1000}} \\
 &= \frac{\sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3}}{\sqrt[3]{2 \times 2 \times 2 \times 5 \times 5 \times 5}} \\
 &= \frac{2 \times 3 \times 3}{2 \times 5} \\
 &= \frac{18}{10} \\
 &= 1.8
 \end{aligned}$$

27. Coins are cylindrical in shape.

Height (h_1) of cylindrical coins = 2 mm = 0.2 cm

Radius (r) of circular end of coins = $\frac{1.75}{2} = 0.875$ cm

Let n coins were melted to form the required cuboids.

Volume of n coins = Volume of cuboids

$$\Rightarrow n \times \pi \times r^2 \times h_1 = l \times b \times h$$

$$\Rightarrow n \times \pi \times (0.875)^2 \times 0.2 = 5.5 \times 10 \times 3.5$$

$$\Rightarrow n = \frac{5.5 \times 10 \times 3.5 \times 7}{(0.875)^2 \times 0.2 \times 22}$$

$$\Rightarrow n = 400$$

Hence, number of coins melted to form such cuboids is 400.

28. Let each of the two equal angles be x° .

$x + x + 75^\circ + 75^\circ = 360^\circ$ (sum of interior angles of a quadrilateral)

$$2x + 150^\circ = 360^\circ$$

$$2x = 360^\circ - 150^\circ$$

$$x = \frac{210^\circ}{2} = 105^\circ$$

29. $(5 - x)(6 - 5x)(2 - x)$

$$= (5 - x)[6(2 - x) - 5x(2 - x)]$$

$$= (5 - x)(12 - 6x - 10x + 5x^2)$$

$$= (5 - x)(12 - 16x + 5x^2)$$

$$= 5(12 - 16x + 5x^2) - x(12 - 16x + 5x^2)$$

$$= 60 - 80x + 25x^2 - 12x + 16x^2 - 5x^3$$

$$= 60 - 92x + 41x^2 - 5x^3$$

30. Euler's Formula:

For a polyhedron having F number of faces, E number of edges and V number of vertices, we have $F + V = E + 2$.

The pentagonal prism looks like as shown below:

Here, the number of faces (F) = 7

Number of edges (E) = 15

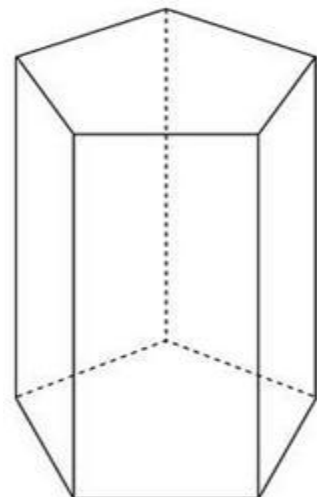
The number of vertices (V) = 10

Now, $F + V = 7 + 10 = 17$

And, $E + 2 = 15 + 2 = 17$

Thus, $F + V = E + 2$

Hence, Euler's formula is verified



31. Suppose the price of the jeans is Rs. 100.

The 30% reduction on Rs. 100.

$$d = 0.30 \times 100 = 30$$

To get the first reduction price, subtract 30 from 100.

$$100 - 30 = 70$$

Now, take the 10% discount on Rs. 70.

$$0.10 \times 70 = 7$$

Subtract 7 from 70.

$$70 - 7 = 63$$

So, the final price after both the reductions is Rs. 63.

To get the amount of change, subtract the old amount from the new amount.

$$63 - 100 = -37$$

Divide by the original amount.

$$\frac{-37}{100} = -37\%$$

So, the percent of decrease is 37%.

The reductions are different. If the jeans are first marked down 30%, and then reduced another 10%: this is only a 37% reduction, not a 40% reduction.

32.

(i) $x^0 \times y^0 \times z^0 = 1 \times 1 \times 1 = 1$

(ii) $\frac{(x^0 + y^0) \times 2^5}{2^4} = (1 + 1) \times 2^{5-4} = 2 \times 2^1 = 4$

(iii) $(4^6)^7 = 4^{6 \times 7} = 4^{42} = (2^2)^{42} = 2^{84}$

(iv)

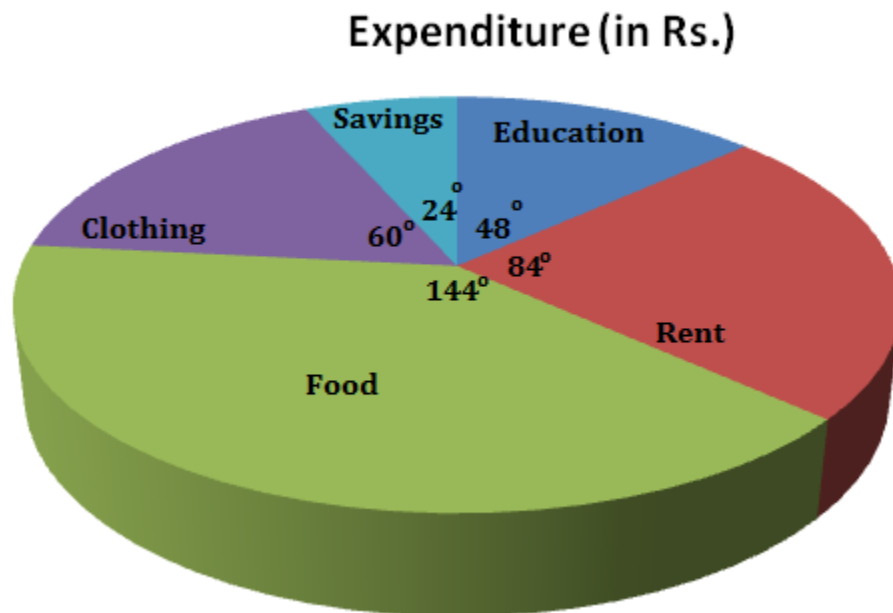
$$\begin{aligned} & \frac{a^2 \times a^3 \times b^3 \times b^4}{a^5 \times b^2} \\ &= \frac{a^{2+3} b^{3+4}}{a^5 \times b^2} \\ &= \frac{a^5 b^7}{a^5 \times b^2} \\ &= a^{5-5} \times b^{7-2} \\ &= a^0 \times b^5 \\ &= 1 \times b^5 \\ &= b^5 \end{aligned}$$

Section D

33.

Items	Expenditure (in Rs.)	Measure of the central angle
Education	2000	$\frac{2000}{15000} \times 360^\circ = 48^\circ$
Rent	3500	$\frac{3500}{15000} \times 360^\circ = 84^\circ$
Food	6000	$\frac{6000}{15000} \times 360^\circ = 144^\circ$
Clothing	2500	$\frac{2500}{15000} \times 360^\circ = 60^\circ$
Savings	1000	$\frac{1000}{15000} \times 360^\circ = 24^\circ$
Total	15000	360°

On the basis of table, the pie diagram is drawn:



34. The ratio of students who preferred blue to students who preferred red:

In Mrs. Valdez's class - 14:6

In Mrs. Kim's class, 8:5

We want to figure out which ratio is higher:

$$\frac{14}{6} \text{ or } \frac{8}{5}$$

We can compare the ratios more easily by expressing them in percentage.

First, write the ratio as a decimal and then convert it to a percentage.

Thus,

$$\frac{14}{6} = 2.33333 = 233.33\%$$

$$\text{And, } \frac{8}{5} = 1.6 = 160\%$$

Comparing, we get $233.33\% > 160\%$

Hence, Mrs. Valdez's class had a higher ratio of students who preferred blue to students who preferred red.

35. From the figure we have

Height (h_1) of larger cylinder = 220 cm

Radius (r_1) of larger cylinder = $\frac{24}{2} = 12$ cm

Height (h_2) of smaller cylinder = 60 cm

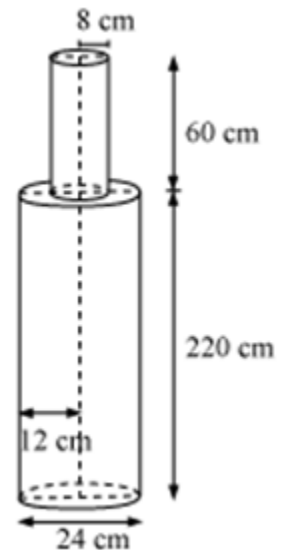
Radius (r_2) of smaller cylinder = 8 cm

Total volume of pole = Volume of larger cylinder + Volume of cylinder

$$\begin{aligned} \text{Total volume of pole} &= \pi r_1^2 h_1 + \pi r_2^2 h_2 \\ &= \pi (12)^2 \times 220 + \pi (8)^2 \times 60 \\ &= \pi [144 \times 220 + 64 \times 60] \\ &= 35520 \times 3.14 \\ &= 1,11,532.8 \text{ cm}^3 \end{aligned}$$

Mass of 1 cm^3 iron = 8 g

Mass of 111532.8 cm^3 iron = $111532.8 \times 8 = 892262.4 \text{ g} = 892.262 \text{ kg}$



36. The cost of 6 balls is Rs. 42.

We know that as the number of balls increases, the cost increases. Thus, they are directly proportional.

Let the cost of 10 balls, 15 balls and 20 balls be x, y, and z, respectively.

Quantity	6	10	15	20
Cost (in Rs)	42	x	y	z

In case of direct proportion, the ratio of the two quantities remains constant.

$$\text{Therefore, } \frac{6}{42} = \frac{10}{x} = \frac{15}{y} = \frac{20}{z}$$

On solving, we get

$$x = 70$$

$$y = 105$$

$$z = 140$$

Thus, we have

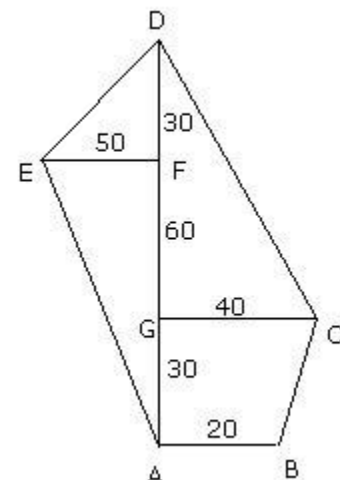
Quantity	10	15	20
Cost (in Rs.)	70	105	140

37. Area of polygon = Area of trapezium ABCG + Area of triangle GCD + Area of triangle DEF + Area of triangle EAF

Now,

$$\begin{aligned} \text{Area of trapezium ABCG} &= \frac{1}{2} \times AG \times (AB + CG) \\ &= \frac{1}{2} \times 30 \times (20 + 40) \\ &= \frac{1}{2} \times 30 \times 60 \\ &= 900 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of triangle GCD} &= \frac{1}{2} \times GC \times DG \\ &= \frac{1}{2} \times 40 \times (60 + 30) \\ &= \frac{1}{2} \times 40 \times 90 \\ &= 1800 \text{ m}^2 \end{aligned}$$



$$\begin{aligned}\text{Area of triangle DEF} &= \frac{1}{2} \times EF \times DF \\ &= \frac{1}{2} \times 50 \times 30 \\ &= 750 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\text{Area of triangle EAF} &= \frac{1}{2} \times EF \times FA \\ &= \frac{1}{2} \times 50 \times (60 + 30) \\ &= \frac{1}{2} \times 50 \times 90 \\ &= 2250 \text{ m}^2\end{aligned}$$

Hence area of polygon = $900 + 1800 + 750 + 2250 = 5700 \text{ m}^2$.a