

Year 6 Problem Solving Part 2

Student Name: _____ Date: _____	Grade: _____ Score: _____
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Score:				

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2 Problem Solving Part 2

2.1 Measurements

Example 2.1.1 A rectangular container of base 25 cm by 18 cm and height of 36 cm is filled with water to a height of 30 cm. By how much will the water level rise if a stone of volume 900 cm^3 is dropped into the container?

Solution: *Volume = $a \times b \times c$ (the product of three dimensions).*

*Or volume = $A \times h$, where A is the base area of the container,
and h is the height of the container,*

When a stone of 900 cm^3 is dropped into the container the volume of water will increase by 900 cm^3

$$\therefore V = A \times h, \Rightarrow 900 = 25 \times 18 \times h, \Rightarrow h = \frac{900}{25 \times 18} = 2 \text{ cm}$$

Therefore the water level will rise by 2 cm.

Exercise 2.1.1

1. The length of a rectangle is three times its breadth. Find the area of the rectangle if its perimeter is 96.

2. A fish tank with a rectangular base of 324 cm^2 contains water to a height of 12 cm. The height of the tank is 20 cm. How much more water is needed to fill the tank to its brim?

Exercise 2.1.2

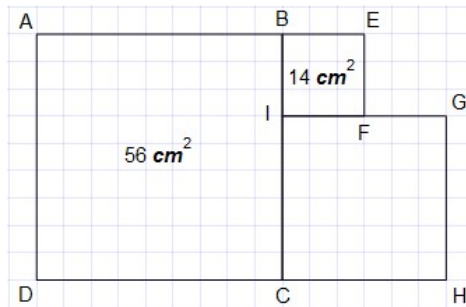
1. A container has a base of 1200 cm^2 and it is filled with water to a height of 18 cm . What is the new height of the water after 6 litres of water have been drawn off?

2. A cuboid has a volume of 1620 cm^3 . Its base is a rectangle which has a perimeter of 54 cm . The ratio of the length to the breadth of the rectangle is $5 : 4$. Find its height.

3. The height of a rectangle tank is 40 cm . This tank contains 1120 cm^3 of water when filled to 8-cm mark. What is the capacity of the tank in litres?

4. The ratio of the length to the breadth to the height of a water container is $12 : 8 : 5$. Its length is 18 cm longer than its breadth. Find the capacity of the container.

Example 2.1.2 The area of the square $ABCD$ is 56 cm^2 and the area of square $BEFI$ is 14 cm^2 . Find the area of the square $IGHC$.



Solution: The area of square $ABCD$ is 56 cm^2 , \Rightarrow , the side of the square is $\sqrt{56}$,
 The area of square $BEFI$ is 14 cm^2 , \Rightarrow , the side of the square is $\sqrt{14}$,
 So size of square $GHCI$ is $\sqrt{56} - \sqrt{14}$,
 The area of the square $GHCI$ is $A = (\sqrt{56} - \sqrt{14})^2$
 $= (\sqrt{56})^2 - 2 \times \sqrt{56} \times \sqrt{14} + (\sqrt{14})^2$
 $= 56 - 2 \times \sqrt{56 \times 14} + 14$
 $= 56 - 2 \times 28 + 14$
 $= 14 \text{ cm}^2$

Exercise 2.1.3

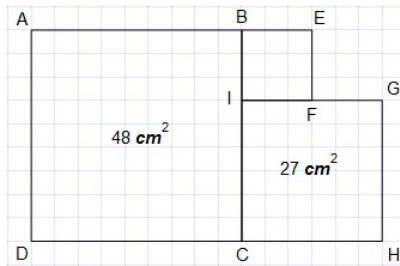
1. The ratio of the perimeter of a rectangle to that of a square is $9 : 4$. The area of the square is 3600 cm^2 . The ratio of the length of the rectangle to its breadth is $7 : 2$. Find the area of the rectangle.

2. The breadth of a rectangle is 20% that of its perimeter. If the length of the rectangle is 54 cm , find the area of the rectangle.

Exercise 2.1.4

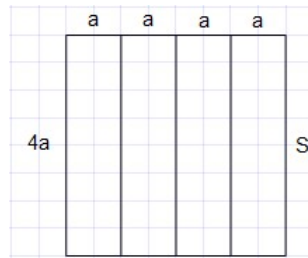
1. A square is transformed into a rectangle with a perimeter of 72 cm, by increasing one side by 6 cm and reducing the adjacent side by 4 cm. Find the area of the original square.

2. The area of the square ABCD is 48 cm^2 and the area of square IGHC is 27 cm^2 . Find the area of the square BEFI.



3. The length of a rectangle is 12 cm. If we increase the width by 4 cm, the perimeter of the rectangle increases by 20%. What is the area of the original rectangle?

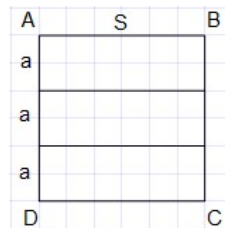
Example 2.1.3 A square is divided into four congruent rectangles. Each of the four rectangles has a perimeter of 25 cm. What is the perimeter of the square?



Solution: The perimeter of each rectangle is $P = (4a + a) \times 2 = 10a$
 Put $10a = 25$, $\Rightarrow a = 2.5$ cm
 So the size of the square is $S = 4 \times 2.5 = 10$ cm.
 Therefore the perimeter of the square is $4 \times 10 = 40$ cm.

Exercise 2.1.5

1. A square is divided into three congruent rectangles. Each of the three rectangles has a perimeter of 24 cm. Find the area of the square.



2. A cuboid has a volume of 8820 cm^3 . The ratio of the length to the breadth of its rectangular base is 5:3. The length is 14 cm longer than the breadth. Find its height.

Example 2.1.4 A rectangular tank with a square base contains some water. The perimeter of one of its vertical faces is 560 cm. The ratio of its length to its height is 2:5.

1. Find the base area of the tank.

Solution: The ratio of the length to the height of the vertical face is 2 : 3,
 the perimeter will have $(2 + 5) \times 2 = 14$ parts,
 each part will be $560 \div 14 = 40$ cm \therefore the length of rectangle is $L = 2 \times 40 = 80$ cm
 The length of the vertical is the side of the base square,
 so the area of the square is: $A = 80^2 = 6400$ cm².

2. When 4 stones are gently placed into the tank, the water level rises by 2.5 cm. Find the average volume of each stone.

Solution: The total volume increase $V = A \times h = 6400 \times 2.5 = 16000$ cm³
 Therefore the average volume of each stone is: $16000 \div 4 = 4000$ cm³.

Exercise 2.1.6 A rectangular tank, 24 cm by 15 cm by 8 cm, is $\frac{3}{5}$ filled with water.

1. How many litres of water are in the tank?

2. How many more litres of water are needed to fill up the tank to the brim?

3. If a metal block of 288 cm³ is placed in the tank, what is the new height of the water level?

Example 2.1.5 The height of a rectangular tank is 60 cm. This tank holds 7200 cm^3 of water when filled to the 12-cm mark.

1. Find the capacity of the tank in litres.

Solution: The 12-cm mark is $\frac{1}{5}$ of the capacity of the water tank,
So the capacity of the water tank is $V = 7200 \times 5 = 36000 \text{ cm}^3 = 36 \text{ Litres}$.

2. How many more litres of water are needed to fill to tank to its brim?

Solution: Since $\frac{1}{5}$ have been filled, it may need $\frac{4}{5}$ of the total to the brim,
 $\therefore V = 4 \times 7200 = 28800 \text{ cm}^3 = 28.8 \text{ Litres}$.

Exercise 2.1.7 The height of the water in a tank which contains 7680 cm^3 of water is 16 cm.

1. Find the base area of the tank.

2. A piece of brick is gently lowered into this tank and the water level rises by 1.5 cm. What is the volume of the brick?

2.2 Practical Exam Questions

1. A quadrant of a circle of area 32 cm^2 is divided into 16 equal parts. The area of three parts would be:
A. 24 cm^2 B. 12 cm^2 C. 16 cm^2 D. 15 cm^2 .
2. The perimeter of a rectangular field is 210 m . If the length is twice the width, what is the area of the field?
A. 2450 cm^2 B. 1800 cm^2 C. 2100 cm^2 D. 1580 cm^2 .
3. The perimeter of a rectangular field is 120 m , If the length is 12 metres greater than the width, What is the area of the field?
A. 648 cm^2 B. 468 cm^2 C. 864 cm^2 D. 576 cm^2 .
4. Four square tables are pushed next to each other to form one large rectangular table. If the perimeter of the new table is 7.5 metres. What is the area of each square table?
A. 5625 cm^2 B. 4225 cm^2 C. 4900 cm^2 D. 5185 cm^2 .
5. A building plan uses a scale of 1 cm to represent 25 m. What distance is drawn on the plan if the actual building measures 135 m?
A. 4.5 cm B. 5 cm C. 6.5 cm D. 5.4 cm .
6. Boxes measuring 10 cm by 5 cm by 5 cm are packed in a carton whose dimensions are 80 cm by 60 cm by 40 cm. What is the maximum number of boxes can be packed in the carton?
A. 685 B. 564 C. 768. D. 640
7. A rectangle has a perimeter of 108 cm . The ratio of its breadth to its length is 2 : 7. What is the area of the rectangle?
A. 618 cm^2 B. 526 cm^2 C. 480 cm^2 D. 504 cm^2 .
8. A square tile measures 30 cm by 30 cm. How many are required to cover the floor of a room which measures 9 m by 7.5 m?
A. 720 B. 680 C. 750 D. 850.
9. A rectangular container with height 16 cm and base 25 cm by 18 cm is three quarters filled. How much water in litres are there in the container?
A. $5.4L$ B. $4.8L$ C. $4.5L$ D. $6.4L$
10. What is the total surface area of the open-box with a base 28 cm by 15 cm and a height of 12 cm?
A. 1024 cm^2 B. 1452 cm^2 C. 1180 cm^2 D. 1685 cm^2

Example 2.2.1 A rectangular tank with a square base of side 25 cm contains 12.5 litres of water when it is $\frac{4}{9}$ full.

1. Find the height of the water in the tank.

Solution: $V = A \times H$, where $A = 25 \times 25 = 625 \text{ cm}^2$
 So $H = V \div A = 12500 \div 625 = 20 \text{ cm}$.

2. What is the height of the tank?

Solution: As $\frac{4}{9}$ of the water is 20 cm, $\Rightarrow \frac{1}{9}$ of the water is $20 \div 4 = 5 \text{ cm}$
 So the height of the water tank is: $9 \times 5 = 45 \text{ cm}$.

3. What will be the new height of the water in the tank if I pour in another two and a half litres of water into it?

Solution: the level of water rise will be $h = V_1 \div A = 2500 \div 625 = 4 \text{ cm}$
 So the new height of the water level is: $20 + 4 = 24 \text{ cm}$.

Exercise 2.2.1 The ratio of the length to the breadth of a rectangular tank is 5 : 2. The perimeter of its rectangular base is 56 cm. The tank contains water of a height of 5.4 cm.

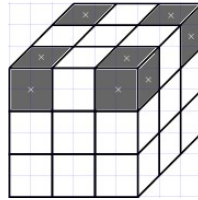
1. Find the base area of the tank.

2. What will be the new height of water in the tank if I pour another 0.72 litres of water into it?

2.3 Quiz

Question 1 (5 marks)

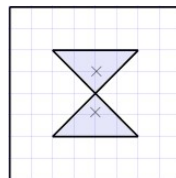
The cuboid is built using blocks. the blocks shaded are removed. Therefore:



- A. the surface area remains the same.
- B. the surface area is increased.
- C. the surface area is reduced.
- D. not enough information to determine.

Question 2 (5 marks)

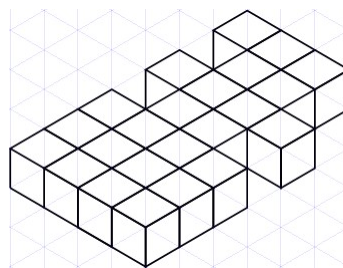
What is the fraction of the shaded area in a square?



- A. $\frac{1}{6}$.
- B. $\frac{1}{8}$
- C. $\frac{1}{10}$
- D. $\frac{1}{12}$.

Question 3 (5 marks)

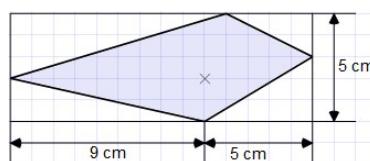
What is the least number of cubes needed to be removed from this solid for it to be a rectangular prism?



- A. 8
- B. 9
- C. 10
- D. 11.

Question 4 (5 marks)

Find the area of the shaded part.



- A. 48 cm^2
- B. 28 cm^2
- C. 30 cm^2
- D. 34.5 cm^2 .

Question 5 (10 marks)

The volume of a water container is 576 cm^3 . Its base is a square of side 8 cm. Find its height.

Question 6 (10 marks)

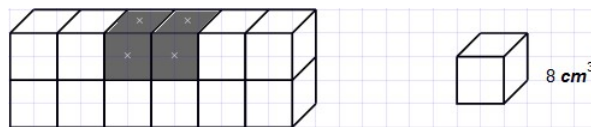
A rectangular tank with a base area of 468 m^2 contained water to a height of 12 cm. I poured 1170 cm^3 more water into it. Find the new height of the water in the tank.

Question 7 (10 marks)

A rectangular tank with a square base contains some water. The perimeter of one of its vertical faces is 80 cm. The ratio of its length to its height is 1:4. Find the capacity of the tank.

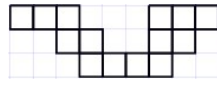
Question 8 (10 marks)

The prism is built using cube blocks. If the shaded blocks are removed, find its total surface area.



Question 9 (10 marks)

Find the perimeter of the figure which is made up of 3-cm squares.



Question 10 (10 marks)

A length of wire is cut into two equal lengths. One of them is bent to form a square. The other is used to form a rectangle, 15 cm long and 9 cm wide. Find the area of the square.

Question 11 (10 marks)

The two identical isosceles triangles form a rhombus shape with an area of 36cm^2 . If the side of the diagonals are to be an integer, what would be the side of its diagonals?

Question 12 (10 marks)

Find the area of the following shape.

