Grade 7 Math, Explained

Unit 9 · Perimeter, Area and Volume

HARDER PRACTICE QUESTIONS

Full marks 35

Write your answers on separate paper. Show your working, one step a line, and write every length in the same unit before you add or multiply. Use the value of π each question gives. The measurements on this sheet are made up for the problems.

1 Spot the errors [4]

Aayusha worked out these four. Each answer is wrong. Find the right answer, and say what went wrong.

i. A triangle has sides of 1.2 m, 90 cm and 80 cm, so its perimeter is $1.2 + 90 + 80 = 171.2$ cm.

ii. A cube has edges of 5 cm, so its total surface area is $5^3 = 125$ cm^2.

iii. A tank is 2 m long, 1 m broad and 0.5 m high, so it holds $2 \times 1 \times 0.5 = 1$ liter.

iv. A wheel has a radius of 14 cm, so in one turn it rolls $\frac{22}{7} \times 14 = 44$ cm.

2 Two triangles, or none [4]

i. An isosceles triangle has a perimeter of 30 cm, and one of its sides is 8 cm. Find its other two sides. There are two answers: find both.

ii. Check that each of your answers really makes a triangle.

iii. Show that no isosceles triangle has a perimeter of 30 cm and a side of 16 cm.

iv. The sides of an isosceles triangle are whole centimeters, and its perimeter is 30 cm. What is the longest that one of its sides can be?

3 Cutting and joining [4]

i. A wooden cube with edges of 14 cm is cut into two equal cuboids by one straight cut parallel to a face. Write the length, breadth and height of each piece.

ii. Find the total surface area of the cube, and of the two pieces together. How much new surface did the cut make?

iii. Did the volume change? Give a reason.

iv. Five cubes with edges of 2 cm are glued face to face in a row. Find the total surface area of the rod they make. Why is it less than the five cubes' surface areas added together?

4 The tank on the roof [4]

Sushant's family has a water tank shaped like a cuboid, 1.5 m long, 1 m broad and 0.8 m high, on its roof.

i. How many liters does it hold when it is full?

ii. The family uses 300 liters a day. By how many centimeters does the water in the tank fall each day?

iii. The tank is full on Sunday morning, and no water comes in. On which day does it run dry?

iv. A neighbor's tank is a cube with edges of 1 m. Which tank holds more, and by how much?

5 Double the edge [4]

i. Find the total surface area and the volume of a cube with edges of 3 cm.
ii. Find them again with the edges doubled to 6 cm. How many times bigger is each?
iii. Kriti says, "If I double every edge of any cuboid, its volume doubles too." Test her claim on a cuboid 4 cm × 3 cm × 2 cm.
iv. In ii the two numbers came out equal. By trying whole numbers, find the cube whose volume, in cm^3, is twice its total surface area, in cm^2. (For edges of a cm, the surface area is $6a^2$ cm^2 and the volume a^3 cm^3.)

6 One wire, three shapes [4]

A piece of wire is bent into an equilateral triangle with sides of 22 cm. ($\pi = \frac{22}{7}$)

i. How long is the wire?
ii. The wire is straightened and bent into a circle. Find the radius of the circle.
iii. It is bent again into an isosceles triangle with a base of 20 cm. How long is each equal side?
iv. Could it be bent into an isosceles triangle whose equal sides are 15 cm each? Give a reason.

7 Big wheels and small wheels [4]

A tractor's back wheels are 1.26 m across, and its front wheels 84 cm across. ($\pi = \frac{22}{7}$)

i. How far does the tractor go in one turn of a back wheel, and in one turn of a front wheel?
ii. On the way from the farm to the market, a back wheel turns 250 times. How far is the market?
iii. How many times does a front wheel turn on the same trip?
iv. On another trip a front wheel turns 1,500 times. How many times does a back wheel turn, and how far is that trip, in km?

8 Think: a longer string [4]

A string fits tightly round the middle of a ball 14 cm across. ($\pi = \frac{22}{7}$)

i. How long is the string?
ii. The string is made 44 cm longer and held in a circle round the ball, the same gap all the way round. What is the new circle's diameter? How big is the gap between the string and the ball?
iii. A rope goes tightly round a round pond 70 m across. It too is made 44 cm longer and held round the pond in the same way. Find the gap.
iv. Suppose a rope went round the whole Earth and was made 44 cm longer. Without the Earth's size, say how big the gap would be, and why.

9 Make your own [3]

i. Give the length, breadth and height of two different cuboids, each with whole-centimeter edges and a volume of 36 cm^3. Which one needs less paper to cover it?
ii. Write a question that gives a triangle's perimeter and two of its sides, in which the "missing side" breaks the rule that any two sides are longer than the third.
iii. Choose a diameter for a wheel so that, with $\pi = 3.14$, it rolls a whole number of centimeters in one turn.