**Lower Elementary:**

*Question:* Rachel the Elf is trying to count reindeer, but she’s only tall enough to count their legs. If Rachel counts 24 reindeer legs, then how many reindeer are there?

**Upper Elementary:**

*Question:* For every 7 gingerbread people Tyler decorates, Sophia decorates 5. If they decorate 60 gingerbread people in total, then how many gingerbread people did Sophia decorate?

**Middle School:**

*Question:* Madison is 18 decimetres tall and casts a 45-decimetre shadow. He decorates a 24-decimetre-tall tree with ornaments, garlands, and a star on top. If the shadow cast by the decorated tree is 71 decimetres and 5 centimetres long, then how much height does the star add to the tree?

**Algebra and Up:**

*Question:* Nora builds a hemispherical igloo with an interior diameter of 18 feet. The walls of the igloo are 1 foot thick, and the entrance takes up the space of 4π cubic feet of snow. What is the volume of snow used to create the walls of the igloo?

**Lower Elementary:**

*Question:* Rachel the Elf is trying to count reindeer, but she’s only tall enough to count their legs. If Rachel counts 24 reindeer legs, then how many reindeer are there?

*Answer:* 6 reindeer

*Solution:* Each reindeer has 4 legs, so Rachel can count the reindeer by grouping the legs by 4. She counts 4, 8, 12, 16, 20, 24 legs, so there must be 6 reindeer.

**Upper Elementary:**

*Question:* For every 7 gingerbread people Tyler decorates, Sophia decorates 5. If they decorate 60 gingerbread people in total, then how many gingerbread people did Sophia decorate?

*Answer:* 25 gingerbread people

*Solution:* Sophia decorated 5 out of 5 + 7 = 12 of the gingerbread people. So, since 5/12 of 60 is 25, Sophia decorated 25 gingerbread people.

**Middle School:**

*Question:* Madison is 18 decimetres tall and casts a 45-decimetre shadow. He decorates a 24-decimetre-tall tree with ornaments, garlands, and a star on top. If the shadow cast by the decorated tree is 71 decimetres and 5 centimetres long, then how much height does the star add to the tree?

*Answer:* 11/2 feet

*Solution:* Since 18 × 21/2 = 45, we know that we multiply the real-life object by 21/2 to find the length of its shadow. So, the decorated tree’s height must be 711/2 ÷ 21/2 = 143/2 × 2/5 = 283/5 decimetres. That means that the star must have added 283/5 – 24 = 43/4 decimetres to the height of the tree.

**Algebra and Up:**

*Question:* Nora builds a hemispherical igloo with an interior diameter of 18 decimetres. The walls of the igloo are 1 decimetre thick, and the entrance takes up the space of 4π cubic decimetres of snow. What is the volume of snow used to create the walls of the igloo?

*Answer:* 1762/3π cubic decimetres

*Solution:* The interior of the igloo has a radius of 18 ÷ 2 = 9 decimetres, so the whole igloo has a radius of 9 + 1 = 10 decimetres. The volume of a sphere is 4/3πr3, so the volume of a hemisphere is 2/3πr3. That means the volume of the whole igloo is 2/3 × π × 103 = 6662/3π cubic decimetres. If we subtract the volume of the interior (2/3 × π × 93 = 486π cubic decimetres) and the snow carved out for the entrance, we get 6662/3π – 486π – 4π = 1762/3π cubic decimetres of snow.