Part 3 - Percentage of a Quantity

(1) Percentage Part of a Whole (pp. 33-34)

➢ Find the value for a percentage part given the value for the whole.

Three methods can be used to find the value of a percentage part of a whole: the fraction method, the unitary method, or the decimal method.

Find the value of 40% of 180.

Fraction method

Convert the percentage to a fraction and find the fraction of the whole.

$$40\% \text{ of } 180 = \frac{4\cancel{0}}{10\cancel{0}} \times 180 = \frac{4 \times 18\cancel{0}}{1\cancel{0}} = 72$$

Note that we can save a step in simplifying by crossing out equal numbers of 0's in the numerator and denominator even if one 0 comes from the numerator of the fraction, and the other from the whole number.

$$\frac{4\cancel{0}}{1\cancel{0}\,\cancel{0}} \times 18\cancel{0} = 72$$

Unitary method

Find the value of 1% by division, and then multiply to find the value of more than 1%.

$$100\% \text{ of } 180 = 180$$
$$1\% \text{ of } 180 = \frac{180}{100} = 1.8$$
$$40\% \text{ of } 180 = 1.8 \times 40 = 72$$

When this method is done in two steps, it often involves multiplying a decimal by a whole number.

The division step and the multiplication step can be combined. This usually involves a fraction and often can be simplified.

$$40\% \text{ of } 180 = \frac{18\cancel{0}}{1\cancel{0}\cancel{0}} \times 4\cancel{0} = 72$$

When the percentage we want to find is a multiple of 10, we can first find the value for 10% instead of 1%.

$$100\% \longrightarrow 180$$
$$10\% \longrightarrow 18$$
$$40\% \longrightarrow 18 \times 4 = 72$$

Decimal method

Convert the percentage to a decimal and multiply the decimal by the whole.

$$40\% \text{ of } 180 = 0.40 \times 180 = 72$$

In this curriculum, the fraction method is preferred, and the decimal method isn't used at this level.

The fractions in these exercises and later ones can be solved in more than one way. For example,

$$\frac{15}{10\cancel{0}} \times 4\cancel{0} = \frac{15 \times \cancel{4}^{2}}{\cancel{10}_{5}} = \frac{\cancel{15}^{3} \times 2}{\cancel{5}_{1}} = 6$$

$$\frac{\cancel{15}^{3}}{\cancel{100}_{20}} \times 40 = \frac{3 \times \cancel{40}^{2}}{\cancel{20}_{1}} = 6$$

Simplifying the fraction as much as possible before performing other operations will make the multiplication easier. The fraction method is shown for most of the solutions in this guide. The unitary method will be used more in *Primary Mathematics 6A*. Allow students to use either method.

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This page shows the two methods for finding the percentage of a quantity.

Method 1:

Tell your student that if we know the value for 100%, we can divide that value by 100 to find the value in 1%. One way to look at this is to say that the bar representing 500 has 100 equal units. Each unit is 1%. To find the value of 1 unit, we divide the total by the number of units. So to find the value of 1%, we divide the total, 500, by 100. Once we know the value of 1 unit, or 1%, we can find the value of 30 units, or 30%, by multiplying the value for 1 unit by 30.

Point out that for this particular problem we can also divide the total into 10 units. Each unit would then be 10%. We can find the value of 10% by dividing the total by 10. 30% would then be 3 units.

$$10\% \text{ of } 500 = 50$$
$$30\% \text{ of } 500 = 50 \times 3 = 150.$$

Method 2:

Explain to your student that since percentage is one way of representing a fraction with a denominator of 100, we can find 30% of 500 by finding $\frac{30}{100}$ of 500.

Have your student show you what steps he would use in solving $\frac{30}{100} \times 500$

From earlier levels, he should realize that he can think of this problem as $\frac{30 \times 500}{100}$ and simplify first before multiplying.

There were **150** children at the concert.

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You may want to have your student use both methods for task 1 and 2. Let him use either method for task 3.

1. 1% of 120 = 1.2
   90% of 120 = 1.2 x 90 = 108
   or: 1% of 120 = $\frac{120}{100}$

   90% of 120 = $\frac{12\cancel{0}}{1\cancel{00}} \times 9\cancel{0} = 12 \times 9 = 108$

   or: 90% of 120 = $\frac{9\cancel{0}}{1\cancel{00}} \times 12\cancel{0} = 9 \times 12 =$ **108**

2. 1% of \$800 = 8
   3% of \$800 = 8 x 3 = 24
   or: 3% of \$800 = $\frac{3}{1\cancel{00}} \times \$8\cancel{00} = \$(3 \times 8) =$ **\$24**

3. (a) 5% of 300
   $= \frac{5}{1\cancel{00}} \times 3\cancel{00}$
   = **15**

   (b) 8% of 200
   $= \frac{8}{1\cancel{00}} \times 2\cancel{00}$
   = **16**

   (c) 20% of 50 kg
   $= \frac{2\cancel{0}}{1\cancel{00}} \times 5\cancel{0}$ kg
   = **10 kg**

   (d) 25% of 40 m
   $= \frac{\cancel{25}^{5}}{\cancel{100}_{2_1}} \times 4\cancel{0}^{2}$ m
   =**10 m**

   (e) 45% of 70 km
   $= \frac{\cancel{45}^{9}}{\cancel{100}_{2}} \times 7\cancel{0}$ km
   $= \frac{63}{2}$ km
   = **31.5 km**

   (f) 75% of 400 g
   $= \frac{75}{1\cancel{00}} \times 4\cancel{00}$ g
   = **300 g**

Workbook Exercise 21