## TOPIC: INTRO TO APPORTIONMENT

### Standard Divisor and Standard Quota

◆ **Apportionment** methods are used to fairly _____ items when each item cannot be broken into parts.

► These methods often rely on **standard divisors** & **standard quotas**.

**EXAMPLE**

A city receives a donation of 100 science kits to apportion to their 5 elementary schools fairly, based on each school's student population. The total number of elementary students in the city is 3000.

| Standard Divisor | Standard Quota |
|---|---|
| The number of _____ per _____. | The number of items given to each _____. |
| $SD = \frac{\text{total population}}{\text{\# of items to allocate}}$ | $SQ = \frac{\text{group population}}{\text{standard divisor}}$ |
| Find **[ ONCE \| FOR EACH GROUP ]** | Find **[ ONCE \| FOR EACH GROUP ]** |

| Schools | Elm | Birch | Oak | Maple | Pine |
|---|---|---|---|---|---|
| Student Pop | 748 | 689 | 637 | 494 | 432 |
| Standard Divisor | | | | | |
| Standard Quota | | | | | |

◆ The standard quota is fair but can result in _____. This is a problem since an item can't be broken into parts.

## TOPIC: INTRO TO APPORTIONMENT

**EXAMPLE**

A country has three provinces, which are labelled X, Y, and Z. The population of each province is provided. The country needs to apportion 60 seats in their legislative body.

| Province | X | Y | Z |
|---|---|---|---|
| Population | 1,200,000 | 850,000 | 450,000 |

(***A***) Find the standard divisor and round to the nearest hundredth.

**Recall**

$$\text{SD} = \frac{\text{total population}}{\text{\# of items to allocate}}$$

(***B***) Find the standard quota for each province. Round to the nearest hundredth.

**Recall**

$$\text{SQ} = \frac{\text{group population}}{\text{standard divisor}}$$

**EXAMPLE**

A country has three regions, which are labelled P, Q, and R. The population of each region is provided. The country needs to apportion 75 seats in their legislative body.

| Region | P | Q | R |
|---|---|---|---|
| Population | 1,500,000 | 900,000 | 600,000 |

(***A***) Find the standard divisor.

(***B***) Find the standard quota for each region.

## TOPIC: INTRO TO APPORTIONMENT

### EXAMPLE

A school is forming a Student Activities Board with representatives from five student hubs. The number of representatives assigned to each club is based on club membership. The total number of students participating in the clubs is 4,080. The table below shows each club's standard quota.

| Club | Robotics | Drama | Environmental | Photography | Chess |
|---|---|---|---|---|---|
| Standard Quota | 9.4 | 7.8 | 6.7 | 5.6 | 4.5 |

(***A***) Find the total number of representatives on the Student Activities Board.

(***B***) Find the standard divisor.

(***C***) Find the number of members in each club.

## TOPIC: INTRO TO APPORTIONMENT

### The Apportionment Problem

◆ Recall: The standard quotas can be decimals. We may need to _____ up **(upper quota)** or down **(lower quota)**.

**EXAMPLE**

A city receives a donation of 100 science kits to apportion to their 5 elementary schools fairly, based on each school's student population. Round each standard quota to the nearest whole number and identify it as either the upper or lower quota.

| Schools | Elm | Birch | Oak | Maple | Pine |
|---|---|---|---|---|---|
| Standard Pop | 748 | 689 | 637 | 494 | 432 |
| Standard Quota | 24.93 | 22.97 | 21.23 | 16.47 | 14.40 |
| Rounded Quota | | | | | |
| Upper or Lower? | | | | | |

Will this fairly apportion *all* kits?

◆ **Apportionment Problem:** Develop a *fair* way to round standard quotas to get the _____ # of allocated items.

## TOPIC: INTRO TO APPORTIONMENT

**PRACTICE**

A country has three provinces, which are labeled X, Y, and Z. The country needs to apportion 60 seats in their legislative body.

| Province | X | Y | Z |
|---|---|---|---|
| Standard Quota | 28.8 | 20.4 | 10.8 |

(***A***) Find the upper quota for each province.

(***B***) Find the lower quota for each province.

**EXAMPLE**

A country has four regions, which are labelled A, B, C, and D. The country computed the standard quota for each region to apportion 100 seats in their legislative body.

| Region | A | B | C | D |
|---|---|---|---|---|
| Standard Quota | 43.5 | 31.7 | 12.8 | 12 |

(***A***) Round each standard quota to the nearest whole number and identify each as an upper quota, lower quota, or both.

(***B***) When rounding the standard quotas to the nearest whole number, do we get a fair apportionment of the 100 seats?