

# Mathematics: STATISTICS & PROBABILITY

## MEASURES OF CENTRAL TENDENCY

**mean:**  $\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n}$

**median:** the middle number

**mode:** the most common number

## MEASURES OF SPREAD

**standard deviation:**  $\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$

**range:**  $R = \text{largest value} - \text{smallest value}$

**interquartile range:**  $IQR = Q_3 - Q_1$

## BINOMIAL PROBABILITY

$P = {}_n C_r (p)^r (q)^{n-r}$

$n$  = trials     $r$  = successes

$p$  = probability of success

$q$  = probability of failure

## TRANSFORMING DATA

Adding  $c$  to each term

- ▶ the mean increases by  $c$
- ▶ the standard deviation is unchanged

Multiplying each term by  $c$

- ▶ both the mean and standard deviation will be multiplied by  $c$

## PERMUTATIONS & COMBINATIONS

$P(n, r) = {}_n P_r = \frac{n!}{(n-r)!}$      $C(n, r) = {}_n C_r = \binom{n}{r} = \frac{n!}{(n-r)!r!}$

- ▶ order matters
- ▶ order doesn't matter

## PROBABILITY OF MULTIPLE EVENTS

**Intersection**     $P(A \cap B) = P(A) \times P(B)$

**Union**     $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

**Conditional**     $P(B|A) = P(A \cap B)/P(A)$

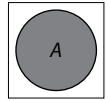
## PROBABILITY OF A SINGLE EVENT

$P(\text{an event}) = \frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$

## SET THEORY

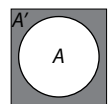
**A**

- ▶ all items in A



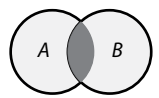
**A'**

- ▶ all items not in A



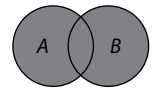
**A ∩ B**

- ▶ items in A and B



**A ∪ B**

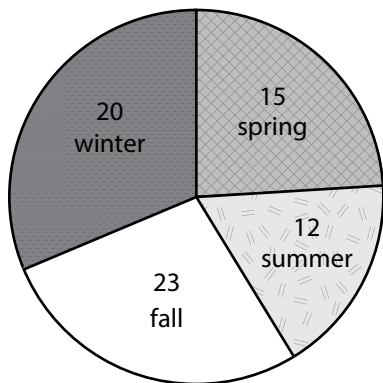
- ▶ items in A or B



## GRAPHS AND CHARTS

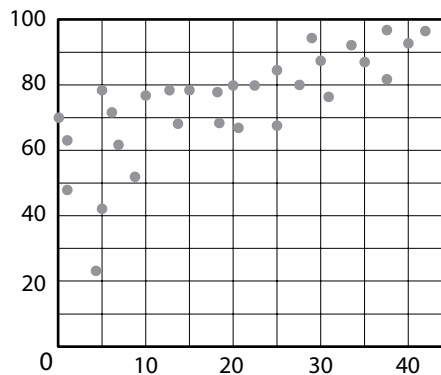
### Pie chart

- ▶ shows parts of a whole



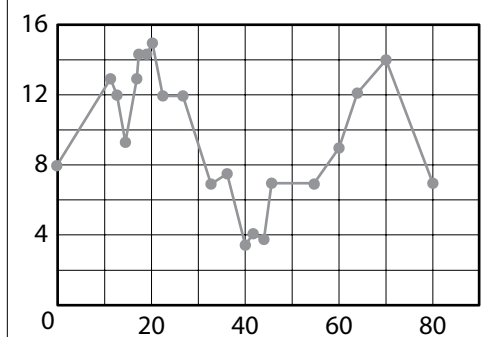
### Scatter plot

- ▶ shows relationships between two continuous variables



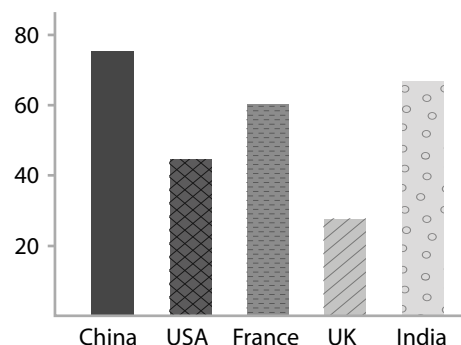
### Line graph

- ▶ shows relationships between two variables and emphasizes change



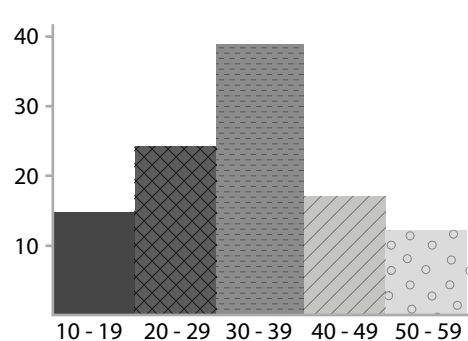
### Bar graph

- ▶ shows relationship between a continuous variable and data in categories



### Histogram

- ▶ shows frequency of data in category or ranges



### Stem and leaf plot

- ▶ shows the general distribution and shape of a data set

Stem	Leaf
0	5
1	6, 7
2	8, 3, 6
3	4, 5, 9, 5, 5, 8, 5
4	7, 7, 7, 8

5|12 = 512