24 Probability

Generally speaking, probability can be defined as

$$\frac{\text{Number of target outcomes}}{\text{Number of total possible outcomes}}$$

Most of the probability questions on the SAT will involve tables of data. For these table questions, probability can be more narrowly defined as

$$\frac{\text{Number in target group within group being selected from}}{\text{Number in group being selected from}}$$

EXAMPLE 1:

	Beef	Chicken
First Class	18	27
Coach	62	138

The table summarizes the distribution of dinner preferences for passengers on a particular flight. If a first class passenger is selected at random from this flight, what is the probability that the selected passenger prefers a beef dinner?

A) $\frac{9}{40}$ B) $\frac{2}{5}$ C) $\frac{3}{5}$ D) $\frac{2}{3}$

The group we're selecting from is the group of first class passengers, of which there are $18 + 27 = 45$. The target group, which must be a subset of the group we're selecting from, consists of first class passengers who prefer a beef dinner, of which there are 18. The desired probability is then

$$\frac{\text{Number of first class passengers who prefer a beef dinner}}{\text{Number of first class passengers}} = \frac{18}{45} = \frac{2}{5}$$

Answer $\boxed{(B)}$.

K Education & Technology

EXAMPLE 2: The table gives the distribution of vehicles on a lot by type and year of manufacture.

	Cars	Trucks	Total
2012	173	126	299
2013	182	143	325
2014	165	109	274
Total	520	378	898

If one of these vehicles is selected at random, which of the following is closest to the probability that the vehicle is either a car manufactured in 2012 or a truck manufactured in 2014?

A) 0.193 B) 0.314 C) 0.352 D) 0.421

In this question, we're selecting from all vehicles on the lot, a total of 898 vehicles. The target group consists of cars manufactured in 2012 and trucks manufactured in 2014, a total of $173 + 109 = 282$ vehicles. The desired probability is then

$$\frac{\text{Number of 2012 cars on the lot + Number of 2014 trucks on the lot}}{\text{Total number of vehicles on the lot}} = \frac{282}{898} \approx 0.314$$

Answer $\boxed{(B)}$.

EXAMPLE 3: The table shows the distribution of occupation and years of experience for workers in a trade union.

	Years of Experience					
	1	2	3	4	5+	Total
Electrician	15	45	20	30	50	160
Welder	25	35	55	10	40	165
Plumber	60	5	65	70	55	255
Carpenter	15	25	50	35	60	185
Total	115	110	190	145	205	765

One of these workers will be selected at random. What is the probability of selecting a plumber, given that the worker has at least 4 years of experience? (Express your answer as a decimal or fraction, not as a percent.)

In probability questions, the phrase *"given that,"* which is just another way of saying *"assuming that,"* always leads to information that narrows down the group being selected from.

In this case, it's assumed that the selected worker will be one of the ones who have at least 4 years of experience, so we're not selecting from the entire group of workers but from those who have at least 4 years of experience. The desired probability is then

$$\frac{\text{Number of plumbers who have 4+ years of experience}}{\text{Number of workers who have 4+ years of experience}} = \frac{70+55}{145+205} = \frac{125}{350} = \boxed{\frac{5}{14}}$$

K Education & Technology

EXERCISE 1: Answers for this exercise start on page 404.

1

A box contains a total of 80 cookies. A cookie is to be selected at random from the box. If the probability that a chocolate chip cookie will be selected is 0.45, how many chocolate chip cookies are in the box?

2

The table summarizes the distribution of color and size for 450 shirts.

	Small	Medium	Large	Total
Gray	55	80	30	165
Navy	45	70	20	135
Black	50	65	35	150
Total	150	215	85	450

If one of these shirts is selected at random, what is the probability of selecting a gray shirt? (Express your answer as a decimal or fraction, not as a percent.)

3

In a display case, there are 11 gold, 30 silver, 17 platinum, and 6 titanium rings. If one of these rings is selected at random, what is the probability of selecting a ring that is neither silver nor titanium?

A) $\frac{17}{64}$

B) $\frac{7}{16}$

C) $\frac{9}{16}$

D) $\frac{7}{9}$

4

The table shows the distribution of sunglass lenses in a box by type and shape.

	Photochromic	Polarized
Rectangular	9	7
Round	5	6

If one of these lenses is selected at random, what is the probability of selecting a round photochromic lens?

A) $\frac{5}{9}$

B) $\frac{5}{11}$

C) $\frac{5}{14}$

D) $\frac{5}{27}$

5

Color	Red	Blue	Black	White	Silver
Percent	20%	33%	10%	14%	

A car manufacturer produces cars in red, blue, black, white, and silver. The incomplete table shows the percentage of cars it produces in each color. If a car produced by the manufacturer is selected at random, what is the probability of selecting a red or silver car?

A) 23%

B) 33%

C) 37%

D) 43%

K Education & Technology

6

A fair die has 12 sides each labeled with a number from 1 through 12, with a different number on each side. Two students each roll this die once. The first student rolls a 3. What is the probability that the second student also rolls a 3?

A) $\frac{1}{4}$

B) $\frac{3}{4}$

C) $\frac{1}{12}$

D) $\frac{1}{144}$

7

The table shows the distribution by type and ink color of pens stored in a bin.

Type	Ink color	Number of pens
Ballpoint	Blue	67
	Black	112
	Red	41
	Green	93
Felt-tip	Blue	24
	Black	136
	Red	58

Based on the table, what fraction of the ballpoint pens stored in the bin have red ink?

A) $\frac{41}{531}$

B) $\frac{41}{313}$

C) $\frac{41}{272}$

D) $\frac{58}{313}$

8

A whole number greater than 10 but less than 20 will be selected at random. What is the probability that the selected number will be even?

A) $\frac{4}{8}$

B) $\frac{4}{9}$

C) $\frac{6}{9}$

D) $\frac{4}{10}$

9

	Violation Type			
	Speeding	Stop sign	Parking	Total
Truck	68	39	17	124
Car	83	51	26	160
Total	151	90	43	284

The table shows the distribution of driving violations recorded by a local police department by type and vehicle. Based on the table, what fraction of the recorded stop sign violations were committed by truck drivers?

A) $\frac{39}{284}$

B) $\frac{39}{124}$

C) $\frac{39}{90}$

D) $\frac{51}{90}$

K Education & Technology

10

	Won	Lost	Total
Underdog	10	35	45
Favorite	25	5	30
Total	35	40	75

The table shows the results of 75 baseball games played by a certain team, categorized by whether the team was considered the favorite (expected to win) in the game or the underdog (expected to lose). What fraction of the games in which the team was considered the underdog did the team win?

A) $\frac{2}{5}$

B) $\frac{2}{7}$

C) $\frac{2}{9}$

D) $\frac{2}{15}$

11

A tank contains a total of n fish, of which g are guppies. If a fish is selected at random from the tank, what is the probability of selecting a fish that is not a guppy?

A) $\frac{n-g}{g+n}$

B) $\frac{n}{g+n}$

C) $1-\frac{g}{n-g}$

D) $1-\frac{g}{n}$

12

	Defective	Not defective	Total
Assembly line A	300	5,700	6,000
Assembly line B	500	3,500	4,000
Total	800	9,200	10,000

A manufacturer uses two assembly lines to produce refrigerator units. The table summarizes the results of a quality control test used to check for defective units. If a refrigerator unit that was checked during this test is selected at random, what is the probability that the unit was produced by assembly line A, given that the unit is defective?

A) $\frac{1}{20}$

B) $\frac{3}{8}$

C) $\frac{3}{5}$

D) $\frac{5}{8}$

13

Data set A: 3, 5, 13, 15, 17, 17

Data set B: 5, 9, 13, 17, 21, 25

The lists give the values in data sets A and B. If a number is selected at random from data set A, what is the probability that the selected number is not a number in data set B?

A) $\frac{1}{6}$

B) $\frac{1}{3}$

C) $\frac{1}{2}$

D) $\frac{2}{3}$

K Education & Technology

14

	$11–20	$21–30	$31+	Total
Cashmere	9	14	28	51
Wool	18	13	44	75
Cotton	40	15	9	64
Total	67	42	81	190

The table summarizes 190 scarves sold at a store by price and material. If a wool scarf is selected at random from this store, what is the probability that the scarf has a price of at least 21 dollars? (Express your answer as a decimal or fraction, not as a percent.)

15

The given table summarizes the distribution of 180 beverage items by type and sugar content, in grams.

	Less than 20 g	20–30 g	Greater than 30 g	Total
Soda	17	35	43	95
Juice	22	56	7	85
Total	39	91	50	180

One of these beverage items will be selected at random. What is the probability of selecting a juice beverage, given that the beverage's sugar content is no more than 30 grams?

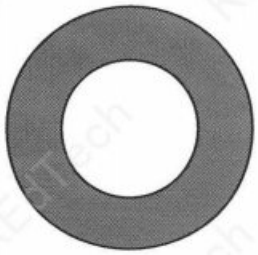
A) $\frac{7}{50}$

B) $\frac{13}{30}$

C) $\frac{3}{5}$

D) $\frac{78}{85}$

16



Note: Figure not drawn to scale.

In the figure shown, a circle with a radius of 4 inches has the same center as a circle with a radius of 6 inches. If a point within the figure is selected at random, what is the probability that the point is within the shaded region? (Express your answer as a decimal or fraction, not as a percent.)

17

Favorite flavor	Percent
Vanilla	28%
Chocolate	14%
Strawberry	24%
Cookies and cream	18%
Coffee	12%
Butter pecan	4%

The table shows the results of a survey in which respondents were asked to specify their favorite ice cream flavor. If a respondent is selected at random, what is the probability that the respondent's favorite flavor is cookies and cream, given that the respondent's favorite flavor is neither vanilla nor coffee?

A) $\frac{9}{50}$

B) $\frac{3}{10}$

C) $\frac{3}{7}$

D) $\frac{9}{20}$

K Education & Technology