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Online Homework

Focused Exercises for Math SAT

Skill Set 13: Probability, Permutations, Combinations

Many of the problems in this exercise set came from The College Board, writers of the SAT exam.

1.

Quiz Score	Number of Students Who Received That Score
0	3
1	6
2	7
3	4

A class of 20 students took a 3-question quiz. The table shows the possible scores on this quiz and the number of students who received each of these scores.

If one of the students is picked at random, what is the probability that the student's quiz score will be greater than 1 ?

(A) $\frac{1}{11}$

(B) $\frac{1}{2}$

(C) $\frac{11}{20}$

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

(E) $\frac{7}{10}$

2.



On the disk shown above, a player spins the arrow twice. The fraction $\frac{a}{b}$ is formed, where a is the number of the sector where the arrow stops after the first spin and b is the number of the sector where the arrow stops after the second spin. On every spin, each of the numbered sectors has an equal probability of being the sector on which the arrow stops. What is the probability that the fraction $\frac{a}{b}$ is greater than 1 ?

(A) $\frac{15}{36}$

(B) $\frac{16}{36}$

(C) $\frac{18}{36}$

(D) $\frac{20}{36}$

(E) $\frac{21}{36}$

3.

<i>A</i>	<i>D</i>
<i>B</i>	<i>E</i>
<i>C</i>	<i>F</i>

The figure above shows the top view of an open square box that is divided into 6 compartments with walls of equal height. Each of the rectangles *D*, *E*, and *F* has twice the area of each of the equal squares *A*, *B*, and *C*. When a marble is dropped into the box at random, it falls into one of the compartments. What is the probability that it will fall into compartment *F*?

(A) $\frac{1}{12}$

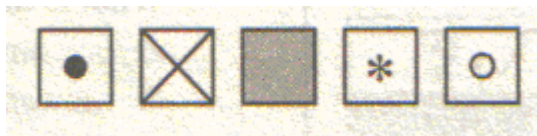
(B) $\frac{1}{8}$


(C) $\frac{1}{6}$

(D) $\frac{2}{11}$

(E) $\frac{2}{9}$

4.



If the 5 cards shown above are placed in a row so that  is never at either end, how many different arrangements are possible?

5.

T-SHIRTS

Color	Size
Red White Blue	Small Medium Large Extra-Large

The tables above show the different colors and sizes of T-shirts that are available at Independence High School. How many different combinations of color and size are possible?

- (A) 7
(B) 12
(C) 15
(D) 25
(E) 64
6. A list of numbers consists of p positive and n negative numbers. If a number is picked at random from this list, the probability that the number is positive is $\frac{3}{5}$. What is the value of $\frac{n}{p}$?
- (A) $\frac{3}{8}$
(B) $\frac{5}{8}$
(C) $\frac{2}{3}$
(D) $\frac{3}{2}$
(E) $\frac{8}{3}$

7. For a class ring, each senior can choose from 4 types of stones and 3 types of metals. How many combinations of a stone and a metal are there?
- (A) 7
(B) 8
(C) 10
(D) 12
(E) 16
8. A bag contains only red marbles, blue marbles, and yellow marbles. The probability of randomly selecting a red marble from this bag is $\frac{1}{4}$, and the probability of randomly selecting a blue marble is $\frac{1}{6}$. Which of the following could be the total number of marbles in the bag?
- (A) 10
(B) 12
(C) 18
(D) 20
(E) 30
9. The Acme Plumbing Company will send a team of 3 plumbers to work on a certain job. The company has 4 experienced plumbers and 4 trainees. If a team consists of 1 experienced plumber and 2 trainees, how many different such teams are possible?
10. If 6 cars out of 10 on an assembly line are red, what is the probability that a car selected at random from the assembly line will be red?
- (A) $\frac{2}{3}$
(B) $\frac{3}{5}$
(C) $\frac{1}{2}$
(D) $\frac{2}{5}$
(E) $\frac{1}{6}$

11. A complete cycle of a traffic light takes 80 seconds. During each cycle, the light is green for 40 seconds, amber for 10 seconds, and red for 30 seconds. At a randomly chosen time, what is the probability that the light will not be red?

(A) $\frac{7}{8}$

(B) $\frac{5}{8}$

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

(D) $\frac{3}{8}$

(E) $\frac{1}{8}$

12. A piece of fruit is to be chosen at random from a basket of fruit. The probability that the piece of fruit chosen will be an apple is $\frac{2}{5}$. Which of the following could NOT be the number of pieces of fruit in the basket?

(A) 20

(B) 35

(C) 52

(D) 70

(E) 80

13. A restaurant menu lists 8 dinners and 3 desserts. How many different dinner-dessert combinations are possible from this menu?

(A) 24

(B) 12

(C) 11

(D) 8

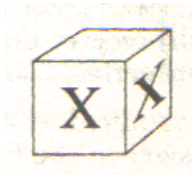
(E) 3

14. A clerk accidentally threw a valuable document into one of 90 trash cans. It is equally likely that the document is in any of these 90 trash cans. If exactly 15 of these 90 trash cans are blue, what is the probability that the document will be in a blue trash can?
- (A) $\frac{1}{4}$
- (B) $\frac{1}{5}$
- (C) $\frac{1}{6}$
- (D) $\frac{1}{15}$
- (E) $\frac{1}{90}$
15. There are 120 red marbles and 80 blue marbles in a bag that contains 200 marbles. If only blue marbles are to be added to the bag so that the probability of randomly drawing a blue marble from the bag becomes $\frac{2}{3}$, how many blue marbles must be added to the bag?
16. There are 3 roads from Plattsville to Ocean Heights and 4 roads from Ocean Heights to Bay Cove. If Martina drives from Plattsville to Bay Cove and back, passes through Ocean Heights in both directions, and does not travel any road twice, how many different routes for the trip are possible?
- (A) 72
- (B) 36
- (C) 24
- (D) 18
- (E) 12
17. A barrel contains only apples and oranges. There are twice as many apples as oranges. The apples are either red or yellow, and 4 times as many apples are red as are yellow. If one piece of fruit is to be drawn at random from the barrel, what is the probability that the piece drawn will be a yellow apple?

18. Five students are to be photographed for the school paper. They are to be arranged standing side by side in a single row with the tallest student in the center and the two shortest students on the ends. If no two students are the same height, how many different arrangements are possible?

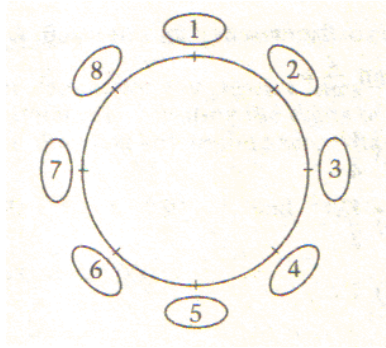
(A) Two
(B) Four
(C) Five
(D) Six
(E) Ten

- 19.



- A plain white cube is marked with an "X" on exactly two adjacent faces as shown above. If the cube is tossed on a flat surface and the cube lands so that an "X" appears on the top face, what is the probability that the bottom face does not have an "X" on it?
20. A teacher is to be assigned to teach 5 different courses in 5 different class periods on Mondays. If exactly one course meets each period, how many different assignments of courses to these class periods are possible for Mondays?

21.



- The figure above represents a circular table with 8 equally spaced chairs labeled 1 through 8. If two students are to sit directly opposite each other, leaving the other chairs empty, how many such arrangements of the two students are possible?
- (A) 4
(B) 8
(C) 16
(D) 28
(E) 56
22. There are 360 students in a certain high school. One of these students is to be selected at random to be a student representative. If the probability that a senior will be selected is $\frac{3}{8}$, how many seniors are in the school?
23. Luis can select one or more of the following 3 toppings for his ice cream: nuts, whipped cream, cherries. If he selects one or more, how many different combinations of toppings are possible? (Assume that the order of the toppings does not matter.)

24. Set T contains only the integers 1 through 50. If a number is selected at random from T , what is the probability that the number selected will be greater than 30 ?

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

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

(C) $\frac{2}{5}$

(D) $\frac{3}{5}$

(E) $\frac{2}{3}$

25. In how many different ways can 5 people arrange themselves in the 5 seats of a car for a trip if only 2 of the people can drive?

(A) 12

(B) 15

(C) 26

(D) 48

(E) 120

26.



If a card is to be selected at random from those in the figure above, which of the following has the greatest probability of being selected?

(A) A card with a letter

(B) A card with a number











(C) A card with stripes

(D) A card with dots

(E) A card with both a letter and stripes






27. Tim wrote a seven-digit phone number on a piece of paper. He later tore the paper accidentally and the last two digits were lost. What is the maximum number of arrangements of two digits, using the digits 0 through 9, that he could use in attempting to reconstruct the correct phone number?
28. Exactly 4 actors try out for the 4 parts in a play. If each actor can perform any one part and no one will perform more than one part, how many different assignments of actors are possible?
- 29.

CRASH PROTECTION RATINGS

Car	Driver Protection	Passenger Protection
<i>A</i>		
<i>B</i>		
<i>C</i>		
<i>D</i>		
<i>E</i>		

Rating System

Worst ← → Best

If the rating system shown is used, how many different combinations of driver and passenger protection ratings is it possible for a car to receive?

- (A) 5
 (B) 10
 (C) 15
 (D) 20
 (E) 25

30. A 6-sided number cube, with faces numbered 1 through 6, is to be rolled twice. What is the probability that the number that comes up on the first roll will be less than the number that comes up on the second roll?

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

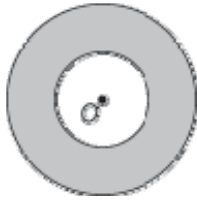
(B) $\frac{1}{3}$

(C) $\frac{5}{12}$

(D) $\frac{7}{12}$

(E) $\frac{1}{2}$

31.



The two circles above each have center O . The radius of the smaller circle is 1, and the radius of the larger circle is 2. If two points are selected at random from the interior of the larger circle, what is the probability that both points will be from the shaded region?

(A) $\frac{1}{16}$

(B) $\frac{1}{4}$

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

(D) $\frac{9}{16}$

(E) $\frac{3}{4}$

32.

Marble 1 was red.

Marble 2 was not red.

Marble 3 was blue.

Marble 4 was the same color as marble 1.

Marble 5 was the same color as marble 2.

A jar contains ten marbles - some are red, some are white, some are blue. The information above is about 5 marbles that were drawn from the jar. If x is the total number of blue marbles drawn, which of the following statements must be true?

(A) The only possible value of x is 1.

(B) The only possible value of x is 2.

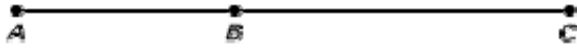
(C) The only possible value of x is 3.

(D) The only possible values of x are 1 and 2.

(E) The only possible values of x are 1 and 3.

33. How many positive four-digit integers have 1 as their first digit and 2 or 5 as their last digit?
- (A) 144
 - (B) 180
 - (C) 200
 - (D) 300
 - (E) 720
34. Of 5 employees, 3 are to be assigned an office and 2 are to be assigned a cubicle. If 3 of the employees are men and 2 are women, and if those assigned an office are to be chosen at random, what is the probability that the offices will be assigned to 2 of the men and 1 of the women?
- (A) $\frac{1}{3}$
 - (B) $\frac{2}{5}$
 - (C) $\frac{1}{2}$
 - (D) $\frac{3}{5}$
 - (E) $\frac{2}{3}$

35.



Note: Figure not drawn to scale.

In the figure above, the length of \overline{AB} is $2x$ and the length of \overline{BC} is $3x$. If a point is chosen at random from \overline{AC} , what is the probability that the point will lie on \overline{BC} ?

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

(B) $\frac{1}{2}$

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

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

(E) $\frac{5}{6}$