Chapter 2. Real Numbers

Ex. 2.6

Answer 1AA.

The complete table that shows the possibilities for a three-child family is shown below.

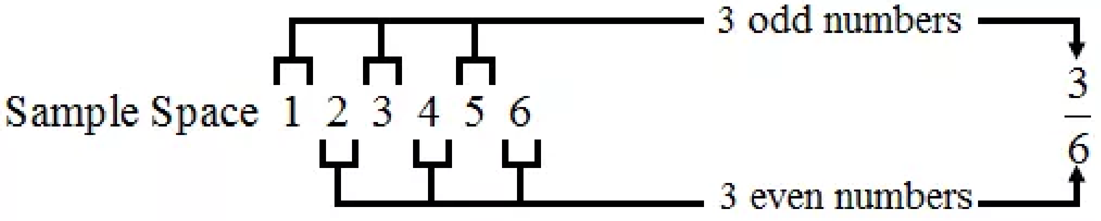
3 boys	**2 boys, 1 girl**	**1 boy, 2 girls**	**3 girls**
BBB	BBG BGB GBB	BGG GBG GGB	GGG

Answer 1CU.

An event that has no chance of occurring is called an impossible event. For example, the probability of getting greater than six when an ordinary six sided die is rolled once is an impossible event because the maximum number in an ordinary six sided die is 6.

An event that is certain to occur is called a certain event. For example, it is Sunday today and will be Monday tomorrow. This is a certain event.

When events have an equal chance to occur are called an equally likely events. When an ordinary die is rolled, the events getting an even number and getting an odd number are equally likely events.



There are six possible outcomes when an ordinary die is rolled, three even numbers and three odd numbers.

$$P(\text{even number}) = \frac{3}{6} \text{ or } \frac{1}{2}$$

$$P(\text{odd number}) = \frac{3}{6} \text{ or } \frac{1}{2}$$

Answer 1PQ.

The sign of the quotient of two numbers having same signs is positive. In the given problem, first number -136 is negative and second number -8 is also negative. Therefore,

$$-136 \div (-8) = \boxed{17}$$

The quotient is positive.

Answer 2AA.

The complete table that shows the possibilities for a four-child family is shown below.

4 boys	3 boys, 1 girl	2 boys, 2 girls	1 boy, 3 girls	4 girls
BBBB	BBBG BBGB BGBB GBBB	BBGG BGBG BGGB GBBG GBGB GGBB	BGGG GBGG GGBG GGGB	GGGG

Answer 2CU.

If the probability that the event will occur is $\frac{3}{5}$, the probability that the event will not occur will be $\left(1-\frac{3}{5}\right)$. The odds of an event occurring is the ratio of the probabilities of the event will occur and the event will not occur. Therefore, the odds of an event occurring if the probability that the event will occur is $\frac{3}{5}$ is shown below.

$$\begin{aligned} \text{odds } &= \frac{3/5}{1-3/5} \\ &= \frac{3/5}{2/5} \\ &= \frac{3}{2} \text{ or } \boxed{3:2} \end{aligned}$$

Answer 2PQ.

The sign of the quotient of two numbers having different signs is negative. In the given problem, first number 15 is positive while second number $-\frac{3}{8}$ is negative. Dividing by a rational number is same as multiplying the reciprocal of that rational number. Therefore,

$$15 \div \left(-\frac{3}{8}\right) = 15 \times \left(-\frac{8}{3}\right)$$
$$= \boxed{-40}$$

The quotient is negative.

Answer 3AA.

The complete table that shows the possibilities for a one-child family is shown below.

1 girl	1 boy
G	B

There are only $2^1 = 2$ possibilities.

The complete table that shows the possibilities for a two-child family is shown below.

2 boys	1 boy, 1 girl	2 girls
BB	BG GB	GG

There are $2^2 = 4$ possibilities.

The complete table that shows the possibilities for a three-child family is shown below.

3 boys	2 boys, 1 girl	1 boy, 2 girls	3 girls
BBB	BBG BGB GBB	BGG GBG GGB	GGG

There are $2^3 = 8$ possibilities.

The complete table that shows the possibilities for a four-child family is shown below.

4 boys	**3 boys, 1 girl**	**2 boys, 2 girls**	**1 boy, 3 girls**	**4 girls**
BBBB	BBBG BBGB BGBB GBBB	BBGG BGBG BGGB GBBG GBGB GGBB	BGGG GBGG GGBG GGGB	GGGG

There are $2^4 = 16$ possibilities.

We can see that total possibilities are 2^n where *n* is number of children in the family. For five-child family, there should be $2^5 = 32$ possibilities. For six-child family, there should be $2^6 = 64$ possibilities.

Answer 3CU.

Probability of an event *a* can be expressed as:

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

A standard deck of cards has total 52 cards and 26 of them are red. Number of favorable cases is 26 and total number of possible outcomes is 52.

$$P(red\ card) = \frac{26}{52} \text{ or } \frac{1}{2}$$

This indicates $\boxed{Doug}$ is correct.

Answer 9PQ.

The sign of the quotient of two numbers having different signs is negative. In the given problem, first number -46.8 is negative while second number 4 is positive. Therefore,

$$(-46.8) \div 4 = \boxed{-11.7}$$

The quotient is negative.

Answer 4AA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

The complete table that shows the possibilities for a three-child family is shown below.

3 boys	**2 boys, 1 girl**	**1 boy, 2 girls**	**3 girls**
BBB	BBG BGB GBB	BGG GBG GGB	GGG

There are 8 possibilities and 3 of them have 2 boys and 1 girl. Number of favorable cases is 3 and total number of possible cases is 8.

$$P(2\text{ boys and 1 girl})=\boxed{\frac{3}{8}}$$

Answer 4CU.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

A standard deck of cards has total 52 cards and 4 (1 five number card per suit) of them are number five. Number of favorable cases is 4 and total number of possible cases is 52.

$$P(5)=\frac{4}{52}$$
$$=\boxed{\frac{1}{13}}$$

Answer 4PQ.

The fraction bar indicates division.

$$\frac{3a+9}{3}=\frac{3a}{3}+\frac{9}{3}$$

Divide $3a$ by 3 and 9 by 3. The sign of the quotient of two numbers having same signs is positive.

$$\frac{3a}{3}+\frac{9}{3}=\boxed{a+3}$$

Answer 5AA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

The complete table that shows the possibilities for a four-child family is shown below.

4 boys	**3 boys, 1 girl**	**2 boys, 2 girls**	**1 boy, 3 girls**	**4 girls**
BBBB	BBBG BBGB BGBB GBBB	BBGG BGBG BGGB GBBG GBGB GGBB	BGGG GBGG GGBG GGGB	GGGG

There are 16 possibilities and 6 of them have 2 boys and 2 girl. Number of favorable cases is 6 and total number of possible cases is 16.

$$P(\text{2 boys and 2 girl}) = \frac{6}{16}$$
$$= \boxed{\frac{3}{8}}$$

Answer 5CU.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

A standard deck of cards has total 52 cards and only 2 of them are red 10. Number of favorable cases is 2 and total number of possible cases is 52.

$$P(red\ 10) = \frac{2}{52}$$
$$= \boxed{\frac{1}{26}}$$

Answer 5PQ.

The fraction bar indicates division.

$$\frac{4x+32}{4}=\frac{4x}{4}+\frac{32}{4}$$

Divide $4x$ by 4 and 32 by 4. The sign of the quotient of two numbers having same signs is positive.

$$\frac{4x}{4}+\frac{32}{4}=\boxed{x+8}$$

Answer 6AA.

In the Pascal's triangle, each number in each row shows the number of ways to have boys and girls for a given number of children. First row has two ones. This means for a one-child family, there is only two possibilities, 1 boy (B) and 1 girl (G). Second row has two ones and one two. This means for a two-child family, there is four possibilities, 1 both are boys (BB), 1 both are girls (GG) and 2 one boy and one girl (BG and GB). Third row has two ones and two threes. This means for a three-child family, there is eight possibilities, 1 all three are boys (BBB), 1 all three are girls (GGG), 3 two boys and one girl (BBG, BGB, GBB) and 3 one boy and two girls (BGG, GBG, GGB). Fourth row has two ones, two fours and one six. This means for a four-child family, there is sixteen possibilities, 1 all four are boys (BBBB), 1 all four are girls (GGGG), 4 three boys and one girl (BBBG, BBGB, BGBB, GBBB), 4 one boy and three girls (BGGG, GBGG, GGBG, GGGB) and 6 two boys and two girls (BBGG, BGBG, BGGB, GBBG, GBGB, GGBB).

Answer 6CU.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

A standard deck of cards has total 52 cards and 20 (5 odd numbers per suit) of them are odd numbers (face cards are neither even nor odd). Number of favorable cases is 20 and total number of possible cases is 52.

$$P(odd\ number)=\frac{20}{52}$$
$$=\boxed{\frac{5}{13}}$$

Answer 6PQ.

The fraction bar indicates division.

$$\frac{15n-20}{-5}=\frac{15n}{-5}+\frac{-20}{-5}$$

Divide $15n$ by -5 and -20 by -5. The sign of the quotient of two numbers having same signs is positive and having different signs is negative.

$$\frac{15n}{-5}+\frac{-20}{-5}=\boxed{-3n+4}$$

Answer 7AA.

In the Pascal's triangle, each number in each row shows the number of ways to have boys and girls for a given number of children. Fourth row has two ones, two fours and one six. This means for a four-child family, there is sixteen possibilities and 4 of them have one boy and three girls. Number of favorable cases is 4 and total number of possible cases is 16.

$$P(1\text{ boy})=\frac{4}{16}$$
$$=\boxed{\frac{1}{4}}$$

Answer 7CU.

Probability of an event *a* can be expressed as:

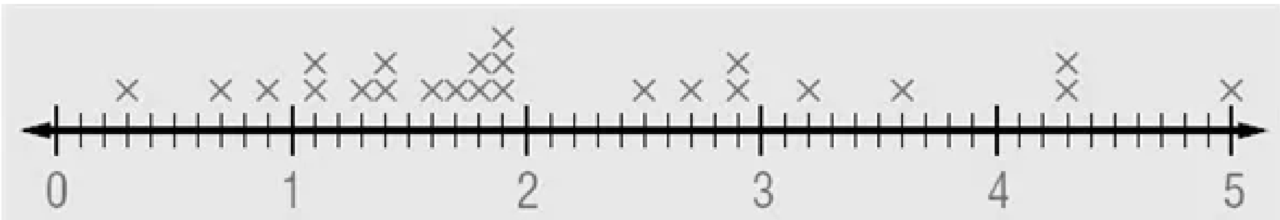
$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

A standard deck of cards has total 52 cards and 2 (1 queen of hearts and 1 jack of diamonds) of them are either queen of hearts or jack of diamonds. Number of favorable cases is 2 and total number of possible cases is 52.

$$P(\text{queen of hearts or jack of diamonds})=\frac{2}{52}$$
$$=\boxed{\frac{1}{26}}$$

Answer 7PQ.

The lowest value is 0.4 and the highest value is 5. So use a scale that includes those values. Here we can take scale 0 – 5.0. Place an $\times$ above each value for each occurrence. The line plot for given data set is shown below.



Answer 8CU.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are three numbers that are multiple of 3 (numbers 3, 6 and 9), and there are $10-3$ or 7 numbers (numbers 1, 2, 4, 5, 7, 8 and 10) that are not a multiple of 3. Therefore, odds of a multiple of 3 is shown below.

$$\text{odds of a multiple of } 3 = \frac{3}{7} \text{ or } \boxed{3:7}$$

Answer 8PQ.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 3 of them have sum of 10. Number of favorable cases is 3 and total number of possible cases is 36.

$$P(\text{sum of } 10) = \frac{3}{36}$$
$$= \boxed{\frac{1}{12}}$$

Answer 9CU.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are three numbers that are even less than 8 (numbers 2, 4 and 6), and there are $10-3$ or 7 numbers (numbers 1, 3, 5, 7, 8, 9 and 10) that are not even less than 8. Therefore, odds of even less than 8 is shown below.

$$\text{odds of even less than } 8 = \frac{3}{7} \text{ or } \boxed{3:7}$$

Answer 9PQ.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 26 of them have sum six or greater than six. Number of favorable cases is 26 and total number of possible cases is 36.

$$\begin{aligned} P(\text{sum} \geq 6) &= \frac{26}{36} \\ &= \boxed{\frac{13}{18}} \end{aligned}$$

Answer 10CU.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are seven numbers that are odd number or blue (numbers 1, 2, 3, 5, 6, 7 and 9), and there are $10-7$ or 3 numbers (numbers 4, 8 and 10) that are not odd number or blue. Therefore, odds of odd number or blue is shown below.

$$\text{odds of odd number or blue} = \frac{7}{3} \text{ or } \boxed{7:3}$$

Answer 10PQ.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 30 of them have sum less than ten. Number of favorable cases is 30 and total number of possible cases is 36.

$$P(\text{sum} < 10) = \frac{30}{36} = \boxed{\frac{5}{6}}$$

Answer 11CU.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are six numbers that are red or yellow (numbers 1, 3, 5, 7, 8 and 10), and there are $10-6$ or 4 numbers (numbers 2, 4, 6 and 9) that are not red or yellow. Therefore, odds of red or yellow is shown below.

$$\begin{aligned}\text{odds of red or yellow} &= \frac{6}{4} \\ &= \frac{3}{2} \text{ or } \boxed{3:2}\end{aligned}$$

Answer 12CU.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

The factors of 48 are shown below.

$$1,\ 2,\ 3,\ 4,\ 6,\ 8,\ 12,\ 16,\ 24,\ 48$$

Out of above 10 factors of 48, only 4 (1, 2, 3 and 6) are not a multiple of 4. Number of favorable cases is 4 and total number of possible cases is 10.

$$\begin{aligned}P(\text{not a multiple of } 4) &= \frac{4}{10} \\ &= \boxed{\frac{2}{5}}\end{aligned}$$

Answer 13CU.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

The factors of 48 are shown below.

$$1,\ 2,\ 3,\ 4,\ 6,\ 8,\ 12,\ 16,\ 24,\ 48$$

Out of above 10 factors of 48, only 3 (12, 24 and 48) have 4 and 6 as two of its factors. Number of favorable cases is 3 and total number of possible cases is 10.

$$P(\text{numbers have 4 and 6 as two of its factors}) = \boxed{\frac{3}{10}}$$

Answer 14CU.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 80 of them are quarters. Number of favorable cases is 80 and total number of possible cases is 300.

$$\begin{aligned}P(\text{quarter})&=\frac{80}{300}\\&=\boxed{\frac{4}{15}}\end{aligned}$$

Answer 15PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 100 of them are dimes. Number of favorable cases is 100 and total number of possible cases is 300.

$$\begin{aligned}P(\text{dime})&=\frac{100}{300}\\&=\boxed{\frac{1}{3}}\end{aligned}$$

Answer 16PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 120 of them are nickels or dollars (70 nickels + 50 one-dollar). Number of favorable cases is 120 and total number of possible cases is 300.

$$\begin{aligned}P(\text{nickel or dollar})&=\frac{120}{300}\\&=\boxed{\frac{2}{5}}\end{aligned}$$

Answer 17PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 150 of them are nickels or quarters (70 nickels + 80 quarters). Number of favorable cases is 150 and total number of possible cases is 300.

$$\begin{aligned} P(\text{nickel or quarter}) &= \frac{150}{300} \\ &= \boxed{\frac{1}{2}} \end{aligned}$$

Answer 18PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 250 of them are less than \$1.00 (70 nickels + 100 dimes + 80 quarters). Number of favorable cases is 250 and total number of possible cases is 300.

$$\begin{aligned} P(\text{value less than \$1.00}) &= \frac{250}{300} \\ &= \boxed{\frac{5}{6}} \end{aligned}$$

Answer 19PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 130 of them are greater than \$0.10 (80 quarters + 50 one-dollar). Number of favorable cases is 130 and total number of possible cases is 300.

$$\begin{aligned} P(\text{value greater than \$0.10}) &= \frac{130}{300} \\ &= \boxed{\frac{13}{30}} \end{aligned}$$

Answer 20PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 130 of them are at least $0.25 (80 quarters + 50 one-dollar). Number of favorable cases is 130 and total number of possible cases is 300.

$$\begin{aligned}P(\text{value at least \$0.25}) &= \frac{130}{300}\\ &= \boxed{\frac{13}{30}}\end{aligned}$$

Answer 21PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 300 coins (70 nickels + 100 dimes + 80 quarters + 50 one-dollar) and 300 of them are at most $1.00 (maximum value of a coin is $1.00). Number of favorable cases is 300 and total number of possible cases is also 300.

$$\begin{aligned}P(\text{value at most \$1.00}) &= \frac{300}{300}\\ &= \boxed{1}\end{aligned}$$

Since probability of this event at most $1.00 is 1. This is a certain event.

Answer 22PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 15 of them are less than 7 (2, 3, 4, 5 and 6). Number of favorable cases is 15 and total number of possible cases is 36.

$$P(\text{sum less than } 7) = \frac{15}{36}$$

$$= \boxed{\frac{5}{12}}$$

Answer 23PA.

Probability of an event a can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 21 of them are less than 7 (2, 3, 4, 5, 6 and 7). Number of favorable cases is 21 and total number of possible cases is 36.

$$P(\text{sum less than } 8) = \frac{21}{36}$$
$$= \boxed{\frac{7}{12}}$$

Answer 24PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and none of them is greater than 12. Number of favorable cases is 0 and total number of possible cases is 36.

$$P(\text{sum is greater than } 12) = \frac{0}{36}$$
$$= \boxed{0}$$

Since probability of event sum is greater than 12 is 0. This is an impossible event.

Answer 25PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and all of them are greater than 1. Number of favorable cases is 36 and total number of possible cases is also 36.

$$\begin{aligned} P(\text{sum is greater than } 1) &= \frac{36}{36} \\ &= \boxed{1} \end{aligned}$$

Since probability of event sum is greater than 1 is 1. This is a certain event.

Answer 26PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 20 of them (6, 7, 8 and 9) are between 5 and 10. Number of favorable cases is 20 and total number of possible cases is also 36.

$$P(\text{sum is between 5 and 10}) = \frac{20}{36}$$
$$= \boxed{\frac{5}{9}}$$

Answer 27PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When two dice are rolled and their sum is recorded, the possible sums are shown below.

	Die 1						
Die 2		1	2	3	4	5	6
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

There are total 36 sums and 25 of them (3, 4, 5, 6, 7 and 8) are between 2 and 9. Number of favorable cases is 25 and total number of possible cases is 36.

$$P(\text{sum is between 2 and 9}) = \boxed{\frac{25}{36}}$$

Answer 28PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and 3 of them are triangles. Number of favorable cases is 3 and total number of possible cases is 6.

$$\begin{aligned} P(\text{triangle}) &= \frac{3}{6} \\ &= \boxed{\frac{1}{2}} \end{aligned}$$

Answer 29PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and only 1 of them is pentagon. Number of favorable cases is 1 and total number of possible cases is 6.

$$P(\text{pentagon}) = \boxed{\frac{1}{6}}$$

Answer 30PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and 3 of them are not triangles. Number of favorable cases is 3 and total number of possible cases is 6.

$$\begin{aligned} P(\text{not a triangle}) &= \frac{3}{6} \\ &= \boxed{\frac{1}{2}} \end{aligned}$$

Answer 31PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and 4 of them are not quadrilaterals. Number of favorable cases is 4 and total number of possible cases is 6.

$$P(\text{not a quadrilateral})=\frac{4}{6}$$
$$=\boxed{\frac{2}{3}}$$

Answer 32PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and 3 of them have more than three sides. Number of favorable cases is 3 and total number of possible cases is 6.

$$P(\text{more than three sides})=\frac{3}{6}$$
$$=\boxed{\frac{1}{2}}$$

Answer 33PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 6 polygons and 3 of them have more than one right angle. Number of favorable cases is 3 and total number of possible cases is 6.

$$P(\text{more than one right angle})=\frac{3}{6}$$
$$=\boxed{\frac{1}{2}}$$

Answer 34PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 30 days in April. Number of favorable cases is 1 and total number of possible cases is 30.

$$P(\text{person's birthday is on } 29^{\text{th}})=\boxed{\frac{1}{30}}$$

Answer 35PA.

Probability of an event *a* can be expressed as:

$$P(a)=\frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 31 days in July and $31-16$ or 15 days after 16th. Number of favorable cases is 15 and total number of possible cases is 31.

$$P(\text{person's birthday is after } 16^{\text{th}})=\boxed{\frac{15}{31}}$$

Answer 36PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are three *a*'s and there are $24-3$ or 21 letters other than *a* in the name "*The United States of America*". Therefore, odds of the letter *a* is shown below.

$$\begin{aligned}\text{odds of the letter } a &= \frac{3}{21}\\ &= \frac{1}{7} \text{ or } \boxed{1:7}\end{aligned}$$

Answer 37PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are four *t*'s and there are $24-4$ or 20 letters other than *t* in the name "*The United States of America*". Therefore, odds of the letter *t* is shown below.

$$\begin{aligned}\text{odds of the letter } t &= \frac{4}{20}\\ &= \frac{1}{5} \text{ or } \boxed{1:5}\end{aligned}$$

Answer 38PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are eleven vowels and there are $24-11$ or 13 consonants in the name "*The United States of America*". Therefore, odds of a vowel is shown below.

$$\text{odds of a vowel} = \frac{11}{13} \text{ or } \boxed{11:13}$$

Answer 39PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are 13 consonants and there are $24-13$ or 11 vowels in the name "*The United States of America*". Therefore, odds of a consonant is shown below.

$$\text{odds of a consonant} = \frac{13}{11} \text{ or } \boxed{13:11}$$

Answer 40PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are 4 uppercase letters and there are $24-4$ or 20 lowercase letters in the name "*The United States of America*". Therefore, odds of an uppercase letter is shown below.

$$\begin{aligned}\text{odds of an uppercase letter} &= \frac{4}{20}\\ &= \frac{1}{5} \text{ or } \boxed{1:5}\end{aligned}$$

Answer 41PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are 9 lowercase vowels and there are $24-9$ or 15 letters other than lowercase vowels in the name "*The United States of America*". Therefore, odds of a lowercase vowel is shown below.

$$\begin{aligned}\text{odds of a lowercase vowel} &= \frac{9}{15}\\ &= \frac{3}{5} \text{ or } \boxed{3:5}\end{aligned}$$

Answer 43PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. Lanette has total 32 stamps (12 + 5 + 3 + 8 + 1 + 3). There are 12 stamps from Mexico and there are $32-12$ or 20 stamps from other countries. Therefore, odds of the stamp is from Mexico is shown below.

$$\begin{aligned}\text{odds of the stamp is from Mexico} &= \frac{12}{20} \\ &= \frac{3}{5} \text{ or } \boxed{3:5}\end{aligned}$$

Answer 44PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. Lanette has total 32 stamps (12 + 5 + 3 + 8 + 1 + 3). There are 3 stamps from France and there are $32-3$ or 29 stamps not from France. Therefore, odds of the stamp is not from France is shown below.

$$\text{odds of the stamp is not from France} = \frac{29}{3} \text{ or } \boxed{29:3}$$

Answer 45PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. Lanette has total 32 stamps (12 + 5 + 3 + 8 + 1 + 3). There are 17 stamps from North American countries and there are $32-17$ or 15 stamps are not from North American countries. Therefore, odds of the stamp is not from North American countries is shown below.

$$\text{odds of the stamp is not from North American countries} = \frac{15}{17} \text{ or } \boxed{15:17}$$

Answer 46PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. Lanette has total 32 stamps (12 + 5 + 3 + 8 + 1 + 3). There are 4 stamps from Germany or Russia and there are $32-4$ or 28 stamps are not from Germany or Russia. Therefore, odds of the stamp is from Germany or Russia is shown below.

$$\begin{aligned}\text{odds of the stamp is from Germany or Russia} &= \frac{4}{28} \\ &= \frac{1}{7} \text{ or } \boxed{1:7}\end{aligned}$$

Answer 47PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. Lanette has total 32 stamps (12 + 5 + 3 + 8 + 1 + 3). There are 13 stamps from Canada or Great Britain and there are $32-13$ or 19 stamps are not from Canada or Great Britain. Therefore, odds of the stamp is from Canada or Great Britain is shown below.

$$\text{odds of the stamp is from Canada or Great Britain} = \frac{13}{19} \text{ or } \boxed{13:19}$$

Answer 48PA.

If the probability that the event will occur is $\frac{3}{7}$, the probability that the event will not occur will be $\left(1-\frac{3}{7}\right)$. The odds of an event occurring is the ratio of the probabilities of the event will occur and the event will not occur. Therefore, the odds of an event occurring if the probability that the event will occur is $\frac{3}{7}$ is shown below.

$$\begin{aligned}\text{odds} &= \frac{3/7}{1-3/7} \\ &= \frac{3/7}{4/7} \\ &= \frac{3}{4} \text{ or } \boxed{3:4}\end{aligned}$$

Answer 49PA.

If the probability that the event will occur is $\frac{2}{3}$, the probability that the event will not occur will be $\left(1-\frac{2}{3}\right)$. The odds of an event not occurring is the ratio of the probabilities of the event will not occur and the event will occur. Therefore, the odds against an event occurring if the probability that the event will occur is $\frac{2}{3}$ is shown below.

$$\begin{aligned}\text{odds against it occurring} &= \frac{1-2/3}{2/3} \\ &= \frac{1/3}{2/3} \\ &= \frac{1}{2} \text{ or } \boxed{1:2}\end{aligned}$$

Answer 50PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are four cards of coworkers and there are $80-4$ or 76 cards of other's. Therefore, odds that one of the coworkers will win a free lunch is shown below.

$$\begin{aligned}\text{odds} &= \frac{4}{76} \\ &= \frac{1}{19} \text{ or } \boxed{1:19}\end{aligned}$$

Answer 51PA.

The board is a square of side 100 cm. The total area of the board is $100 \times 100 = 10{,}000 \text{ cm}^2$. This board has two shaded squares of side 25 cm and a rectangle of sides $100 \text{ cm} \times 35 \text{ cm}$. Area of one shaded square is $25 \times 25 = 625 \text{ cm}^2$ and area of shaded rectangle is $100 \times 35 = 3500 \text{ cm}^2$. Therefore, total shaded area is shown below.

$$2(625) + 3500 = 4750 \text{ cm}^2$$

Probability of an event a can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

The total area of the board is $10{,}000 \text{ cm}^2$ and 4750 cm^2 of them are shaded. Number of favorable cases is 4750 and total number of possible cases is 10,000.

$$\begin{aligned} P(\text{shaded region}) &= \frac{4750}{10{,}000} \\ &= \boxed{0.475} \end{aligned}$$

Answer 52PA.

The board is a square of side 100 cm. The total area of the board is $100 \times 100 = 10{,}000 \text{ cm}^2$. This board has two shaded squares of side 25 cm and a rectangle of sides $100 \text{ cm} \times 35 \text{ cm}$. Area of one shaded square is $25 \times 25 = 625 \text{ cm}^2$ and area of shaded rectangle is $100 \times 35 = 3500 \text{ cm}^2$. Therefore, total shaded area is shown below.

$$2(625) + 3500 = 4750 \text{ cm}^2$$

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are 4750 cm^2 shaded region, and there are $10{,}000 - 4750$ or 5250 cm^2 non shaded region. Therefore, odds against placing a game piece on a shaded region is shown below.

$$\begin{aligned} \text{odds against placing a game piece on a shaded region} &= \frac{5250}{4750} \\ &= \frac{21}{19} \text{ or } \boxed{21:19} \end{aligned}$$

Answer 53PA.

The board is a square of side 100 cm. The total area of the board is $100 \times 100 = 10{,}000 \text{ cm}^2$. Area of green rectangle is $100 \times 35 = 3500 \text{ cm}^2$. The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are 3500 cm^2 area of green rectangle, and there are $10{,}000 - 3500$ or 6500 cm^2 non green region. Therefore, odds that a game piece will be placed within the green rectangle is shown below.

$$\begin{aligned} \text{odds that a game piece will be placed within the green rectangle} &= \frac{3500}{6500} \\ &= \frac{7}{13} \text{ or } \boxed{7:13} \end{aligned}$$

Answer 54PA.

First we find the complete data set from the stem-leaf-plot.

30	30	30	30	31	31	31	31	31	31
31	32	32	32	33	33	34	34	34	35
35	35	36	36	36	37	37	38	38	39
40	41	41	41	41	42	42	43	43	43
44	44	47	47	49	50				

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

There are total 46 players and 24 of them hit more than 35 home runs. Number of favorable cases is 24 and total number of possible cases is 46.

$$\begin{aligned} P(\text{hit more than 35 home runs}) &= \frac{24}{46} \\ &= \boxed{\frac{12}{23}} \end{aligned}$$

Answer 55PA.

First we find the complete data set from the stem-leaf-plot.

30	30	30	30	31	31	31	31	31	31
31	32	32	32	33	33	34	34	34	35
35	35	36	36	36	37	37	38	38	39
40	41	41	41	41	42	42	43	43	43
44	44	47	47	49	50				

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur. There are total 46 players, 42 of them hit fewer than 45 home runs and $46-42=4$ of them hit more than 45 home runs. Therefore, odds that a randomly selected player hit fewer than 45 home runs is shown below.

$$\begin{aligned} \text{odds} &= \frac{42}{4} \\ &= \frac{21}{2} \text{ or } \boxed{21:2} \end{aligned}$$

Answer 56PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

If a player batted 439 times and hit 38 home runs. Number of favorable cases is 38 and total number of possible cases is 439.

$$P(\text{hit a home run}) = \boxed{\frac{38}{439}}$$

Answer 57PA.

The odds of an event occurring is the ratio that compares the number of ways an event can occur to the number of ways it cannot occur and probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

Odds of winning the grand prize $1:1,000,000$ indicates that out of $1+1,000,000$ or $1,000,001$ cards, only 1 is winning card. Number of favorable cases is 1 and total number of cases is $1,000,001$. The probability that the randomly selected game card is the winning game card for the grand prize is shown below.

$$P(\text{winning game card}) = \boxed{\frac{1}{1,000,001}}$$

Answer 58PA.

The more number of cards you have means more chance of winning. If you purchase 2 cards then you will have chance of winning 2 in a 1,000,000, if you purchase 3 cards then you will have chance of winning 3 in a million and so on, even if you purchase 10 cards, then you will have chance of winning 10 in a million or 1 in 100,0000. Your odds of winning the grand prize is not so significant until you have hundred thousand of game cards.

Answer 59PA.

Probability of an event a can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

When three coins are tossed and a tail appears on at least one of them, the possible outcomes are shown below.

H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

There are total 7 outcomes and 6 of them have at least one head. Number of favorable cases is 6 and total number of possible cases is 7.

$$P(\text{at least one head}) = \boxed{\frac{6}{7}}$$

Answer 60PA.

The two sports in which probability is used are baseball and basketball. In baseball, by using the probability, the team can get base runners and in basketball, by using probability that a player can make a basket from a certain place on the court, team can select the position of the player. Odds in favor and odds against of an event can also be used to show the chance other than probability.

Answer 61PA.

If the probability that the event will occur is $\frac{12}{25}$, the probability that the event will not occur will be $\left(1-\frac{12}{25}\right)$. The odds of an event not occurring is the ratio of the probabilities of the event will not occur and the event will occur. Therefore, the odds of an event not occurring if the probability that the event will occur is $\frac{12}{25}$ is shown below.

$$\begin{aligned} \text{odds} &= \frac{1-12/25}{12/25} \\ &= \frac{13}{12} \text{ or } 13:12 \end{aligned}$$

Hence, the correct option is $\boxed{B}$.

Answer 62PA.

Probability of an event *a* can be expressed as:

$$P(a) = \frac{\text{number of favorable cases}}{\text{total number of possible cases}}$$

Inequality $3x+2 \le 17$ means $x \le (17-2)/3$ or $x \le 5$. There are total 15 numbers in the domain and 12 of them satisfy the inequality $3x+2 \le 17$ or $x \le 5$. Number of favorable cases is 12 and total number of cases is 15.

$$\begin{aligned} P(3x+2 \le 17) &= \frac{12}{15} \\ &= \frac{4}{5} \\ &= \frac{4}{5} \times 100\% \\ &= 80\% \end{aligned}$$

Hence, the correct option is $\boxed{D}$.

Answer 63MYS.

In a stem-and-leaf plot, the greatest common place value is used for the stems. The numbers in the next greatest place value are used to form the leaves. In the given data, the greatest place value is tens. Thus, 58.3 would have a stem of 5 and a leaf of 8.3. A complete stem-and-leaf plot for the given data is shown below. Here $5|8.3 = 58.3$.

Stem	**Leaf**
5	8.3
6	4.3 5.1 5.5 6.7 7.0 8.7 9.3
7	0.0 2.8 3.2 5.8 7.4

Answer 64MYS.

Given $b = \frac{2}{5}$ and $c = \frac{1}{2}$. First plug values of *b* and *c* in the given expression.

$$b \div c = \frac{2}{5} \div \frac{1}{2}$$

Dividing by a rational number is same as multiplying the reciprocal of that rational number.

$$\frac{2}{5} \div \frac{1}{2} = \frac{2}{5} \times \frac{2}{1}$$
$$= \boxed{\frac{4}{5}}$$

Answer 65MYS.

Given $a=-\frac{1}{3}$ and $b=\frac{2}{5}$. First plug values of *a* and *b* in the given expression.

$$2a \div b = 2\left(-\frac{1}{3}\right) \div \frac{2}{5}$$
$$= -\frac{2}{3} \div \frac{2}{5}$$

Dividing by a rational number is same as multiplying the reciprocal of that rational number.

$$-\frac{2}{3} \div \frac{2}{5} = -\frac{2}{3} \times \frac{5}{2}$$
$$= -\frac{5}{3} \text{ or } \boxed{-1\frac{2}{3}}$$

Answer 66MYS.

Given $a=-\frac{1}{3}$, $b=\frac{2}{5}$ and $c=\frac{1}{2}$. First plug values of *a*, *b* and *c* in the given expression.

$$\frac{ab}{c} = \frac{\left(-\frac{1}{3}\right)\left(\frac{2}{5}\right)}{\left(\frac{1}{2}\right)}$$
$$= \frac{\left(-\frac{2}{15}\right)}{\left(\frac{1}{2}\right)}$$

The fraction bar indicates division.

$$\frac{\left(-\frac{2}{15}\right)}{\left(\frac{1}{2}\right)} = \left(-\frac{2}{15}\right) \div \left(\frac{1}{2}\right)$$

Dividing by a rational number is same as multiplying the reciprocal of that rational number.

$$\left(-\frac{2}{15}\right) \div \left(\frac{1}{2}\right) = -\frac{2}{15} \times \frac{2}{1}$$
$$= \boxed{-\frac{4}{15}}$$

Answer 67MYS.

To add rational numbers with different signs, subtract the lesser absolute value (4.3) from the greater absolute value (8.2). The sum has the same sign as the number with the greater absolute value. Here greater absolute value, (8.2) has negative sign.

$$4.3+(-8.2)=\boxed{-3.9}$$

Answer 68MYS.

To add rational numbers with different signs, subtract the lesser absolute value (7.8) from the greater absolute value (12.2). The sum has the same sign as the number with the greater absolute value. Here greater absolute value, (12.2) has negative sign.

$$-12.2+7.8=\boxed{-4.4}$$

Answer 69MYS.

To add rational numbers with the same sign, add their absolute values. The sum has the same sign as the addends. Here both values have negative sign.

$$\begin{aligned}-\frac{1}{4}+\left(-\frac{3}{8}\right)&=-\frac{1}{4}\times\frac{2}{2}+\left(-\frac{3}{8}\right)\\&=-\frac{2}{8}+\left(-\frac{3}{8}\right)\\&=\boxed{-\frac{5}{8}}\end{aligned}$$

Answer 70MYS.

To add rational numbers with different signs, subtract the lesser absolute value $\left(\frac{7}{12}\right)$ from the greater absolute value $\left(\frac{5}{6}\right)$. The sum has the same sign as the number with the greater absolute value. Here greater absolute value, $\left(\frac{5}{6}\right)$ has negative sign.

$$\begin{aligned}\frac{7}{12}+\left(-\frac{5}{6}\right)&=\frac{7}{12}+\left(-\frac{5}{6}\right)\left(\frac{2}{2}\right)\\&=\frac{7}{12}+\left(-\frac{10}{12}\right)\\&=-\frac{3}{12}\\&=\boxed{-\frac{1}{4}}\end{aligned}$$

Answer 71MYS.

Absolute values are always greater than or equal to zero.

$$|4.25| = \boxed{4.25}$$

Answer 72MYS.

Absolute values are always greater than or equal to zero.

$$|-8.4| = \boxed{8.4}$$

Answer 73MYS.

Absolute values are always greater than or equal to zero.

$$\left|-\frac{2}{3}\right| = \boxed{\frac{2}{3}}$$

Answer 74MYS.

Absolute values are always greater than or equal to zero.

$$\left|\frac{1}{6}\right| = \boxed{\frac{1}{6}}$$

Answer 75MYS.

Use 6 as a factor 2 times.

$$6^2 = 6 \times 6$$

Now multiply 6 with 6. The product of two numbers having same sign is always positive.

$$6 \times 6 = \boxed{36}$$

Answer 76MYS.

Use 17 as a factor 2 times.

$$17^2 = 17 \times 17$$

Now multiply 17 with 17. The product of two numbers having same sign is always positive.

$$17 \times 17 = \boxed{289}$$

Answer 77MYS.

Use -8 as a factor 2 times.

$$(-8)^2 = (-8) \times (-8)$$

Now multiply (-8) with (-8). The product of two numbers having same sign is always positive.

$$(-8) \times (-8) = \boxed{64}$$

Answer 78MYS.

Use -11.5 as a factor 2 times.

$$(-11.5)^2 = (-11.5)\times(-11.5)$$

Now multiply (-11.5) with (-11.5). The product of two numbers having same sign is always positive.

$$(-11.5)\times(-11.5) = \boxed{132.25}$$

Answer 79MYS.

Use 1.6 as a factor 2 times.

$$(1.6)^2 = 1.6\times1.6$$

Now multiply (1.6) with (1.6). The product of two numbers having same sign is always positive.

$$1.6\times1.6 = \boxed{2.56}$$

Answer 80MYS.

Use $\frac{5}{12}$ as a factor 2 times.

$$\left(\frac{5}{12}\right)^2 = \frac{5}{12}\times\frac{5}{12}$$

Now multiply $\left(\frac{5}{12}\right)$ with $\left(\frac{5}{12}\right)$. The product of two numbers having same sign is always positive.

$$\frac{5}{12}\times\frac{5}{12} = \boxed{\frac{25}{144}}$$

Answer 81MYS.

Use $\left(-\frac{4}{9}\right)$ as a factor 2 times.

$$\left(-\frac{4}{9}\right)^2 = \left(-\frac{4}{9}\right)\times\left(-\frac{4}{9}\right)$$

Now multiply $\left(-\frac{4}{9}\right)$ with $\left(-\frac{4}{9}\right)$. The product of two numbers having same sign is always positive.

$$\left(-\frac{4}{9}\right)\times\left(-\frac{4}{9}\right) = \boxed{\frac{16}{81}}$$

Answer 82MYS.

Use $\left(-\frac{16}{15}\right)$ as a factor 2 times.

$$\left(-\frac{16}{15}\right)^2=\left(-\frac{16}{15}\right)\times\left(-\frac{16}{15}\right)$$

Now multiply $\left(-\frac{16}{15}\right)$ with $\left(-\frac{16}{15}\right)$. The product of two numbers having same sign is always positive.

$$\left(-\frac{16}{15}\right)\times\left(-\frac{16}{15}\right)=\boxed{\frac{256}{225}}$$