

# 21. [Probability / Statistics]

## Skill 21.1 Recognizing the likelihood of an event.

MMYellow 1 1 2 2 3 3 4 4  
MMRed 1 1 2 2 3 3 4 4

**Q.** Which alternative is closest in meaning to the expression "Par for the course"?

- A) certain
- B) likely
- C) impossible

**A. B**

Consider each alternative.

Par on a golf course is set so that 'some' people can achieve it.

Par is neither certain, nor impossible.

**a)** Which alternative is closest in meaning to the expression "Skating on thin ice"?

- A) most likely to succeed
- B) unlikely to succeed
- C) certain to succeed

**b)** Which alternative is closest in meaning to the expression "Find a needle in a haystack"?

- A) occurs about half the time
- B) not common
- C) extremely rare

**c)** Which alternative is closest in meaning to the expression "Fat chance"?

- A) 50 - 50 chance
- B) unlikely
- C) certain

**d)** Which alternative is closest in meaning to the expression "It's a toss up"?

- A) 50 - 50 chance
- B) unlikely
- C) impossible

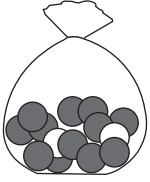
**e)** Choose the best phrase (*are likely to / are unlikely to / will not*) to complete this statement:  
"You ..... live in the same house for the rest of your life."

**f)** Choose the best phrase (*is certain to / is likely to / is unlikely to / will not*) to complete this statement:  
"The Sun ..... rise in the west tomorrow."

**g)** Choose the best phrase (*is certain to / is likely to / is unlikely to / will not*) to complete this statement:  
"Someone in your family ..... win the first division of the lottery."

**h)** Choose the best phrase (*is certain to / is likely to / is unlikely to / will not*) to complete this statement:  
"Friday ..... immediately follow Thursday."

**Q.** There are 2 white marbles and 12 green marbles in a bag. What is the chance that the first marble drawn from the bag will be white: Impossible, unlikely, likely or certain?



**A. unlikely**

Only 2 of the 14 marbles are white. Only 2 out of 14 draws will give a white marble.

It is not impossible but it is unlikely that with your first draw you will pick a white marble.

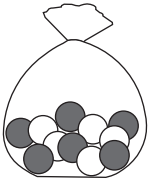
There are 12 chances to draw a green marble.

**a)** In a lotto draw, balls numbered 1 to 50 are mixed together. A machine then randomly selects balls numbered 8, 14, 2, 26 and 42. Is the sixth number drawn:  
A) more likely to be odd than even,  
B) more likely to be even than odd or  
C) just as likely to be odd as even?

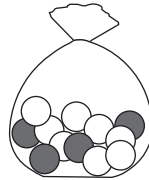
**A**

**b)** In a lotto draw, balls numbered 1 to 50 are mixed together. A machine then randomly selects balls numbered 8, 14, 2, 21 and 17. Is the sixth number drawn:  
A) more likely to be more than 25,  
B) more likely to be less than 25 or  
C) just as likely to be less than 25 as more than 25?

**c)** There are 6 green and 5 white marbles in a bag. One marble is to be taken from the bag without looking. Which color is more likely to be drawn out, green or white?



**d)** There are 8 white marbles and 4 green marbles in a bag. What is the chance that the first marble drawn from the bag will be white: Impossible, unlikely, likely or certain?



**e)** There are six pairs of runners in the back of Mike's closet. Because the closet is dark, how many individual runners must he take out of the closet to make sure he has a matching pair of runners?

**f)** There are twelve pillow cases in our linen cabinet. Four are pink. Mom reaches inside the cabinet in the dark. How many pillow cases does she need to take out of the cabinet to make sure she has two pink ones?



**Q.** A boy and a girl have to be chosen for the school board. How many possible pairs can be chosen from 12 boys and 15 girls?

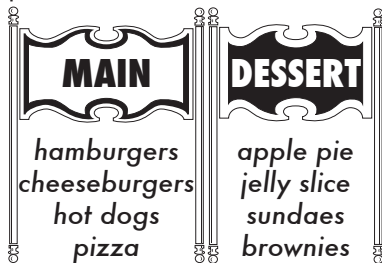
**A.**  $12 \times 15 = 180$

Consider that one boy can form a pair with each of the 15 girls.

Each of the 12 boys can make 15 different pairs.

There are  $12 \times 15$  pairs all together.

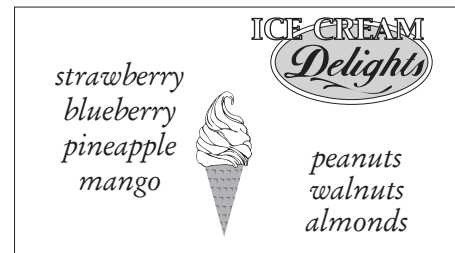
**a)** At Feel Good fast food, a discount applies when ordering one main course and one dessert. How many possible combinations can be served?



$4 \times 4 = 16$

16

**b)** An ice cream comes with one fruit topping and one nut topping at Ice Cream Delights. How many combinations can he choose from?




**c)** At the cinema, ice creams are sold in the following flavors: chocolate, vanilla, strawberry, mint and orange. There is a regular and low fat option for each flavor. How many combinations of 1 flavor and 1 fat option can be sold?

**d)** Delta has a pair of black jeans, a pair of blue jeans and a pair of white jeans. She also has a blue shirt, a red shirt, a white shirt and a black shirt. How many combinations of one pair of jeans and one shirt can she wear?

**e)** Marie has to choose one of her six pairs of sunglasses and one of her four hats. How many different combinations can she wear?

**f)** There are ten 'new release' movies and ten 'weekly' movies left on the shelf. How many different combinations of one of each are possible?

**g)** Xavier is buying a new bicycle. He has a choice of three models and eight colors. How many different bicycle choices are possible?

**h)** A new car is available in five different exterior colors and three different interior colors. How many different color combinations are possible?

## Skill 21.5 Calculating the average (mean) of a set of data.

- Find the sum (total) of all numbers in the set of data.
- Divide the total by the number of items in the set of data.

Another word for Average is Mean

**Q.** What is the average speed in the air of these birds?

Average Speed in the Air (mph)					
gull	crow	oyster catcher	swift	crane	swan
25	25	60	120	30	55

**A. 52.5 mph**

Add all the numbers together:

$$25 + 25 + 60 + 120 + 30 + 55 = 315$$

There are six numbers in the set of data.

Divide the total by 6:

$$315 \div 6 = 52.5$$

$$\begin{array}{r} 52.5 \\ 6 \overline{)315.0} \end{array}$$

**a)** What is the average wing span of these birds?

Wing Spans (ft)				
barn owl	goose	white pelican	condor	stork
3	6	10	10	11

Sum:  $3 + 6 + 10 + 10 + 11 = 40$

Mean:  $40 \div 5 =$   ft

**b)** What is the average weekly wage in this company?

Company Weekly Wages				
office assistant	manager	general employee	assistant	owner
\$400	\$1000	\$300	\$600	\$1500

Sum:

Mean:

**c)** What is the average speed of these land animals?

Average Speed on the Ground (mph)				
lion	crocodile	elephant	cheetah	horse
50	8	25	69	43

mph

**d)** What is the average loudness of these typical noises?

Typical Noises in Decibels (dB)			
normal conversation	dial tone	car interior in city traffic	train whistle
65	80	85	90

dB

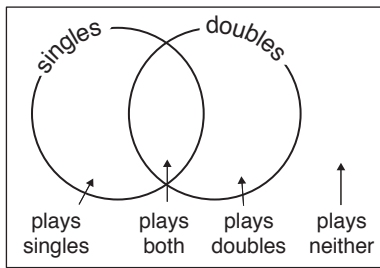
**e)** Consider the data: 5, 15, 10, 15, 5, 10, 10  
What is the mean?

$5 + 15 + 10 + 15 + 5 + 10 + 10 = 70$

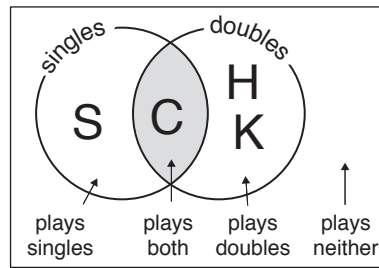
**f)** Consider the data: 2, 6, 10, 14, 12, 16  
What is the mean?

**Q.** Use the data in the table to correctly place each person's initial on the Venn diagram.

Name	plays singles	plays doubles	plays both
Charles (C)			✓
Harry (H)		✓	
Shirley (S)	✓		
Koreen (K)		✓	

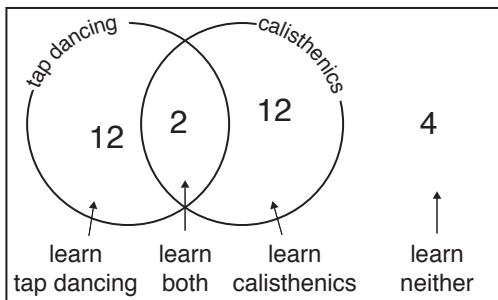


**A.**



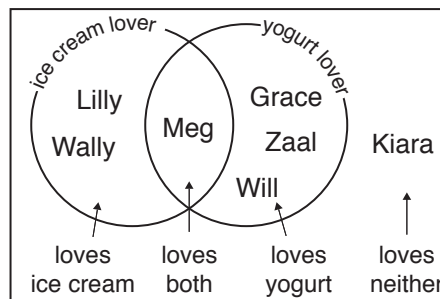
The overlapping area of the circles shows people who play both singles and doubles. 'C' goes in the overlap. 'H' and 'K' go in the part of the circle on the doubles side of the overlap. They play only doubles. 'S' goes in the part of the circle on the singles side of the overlap.

**a)** How many girls learn calisthenics?



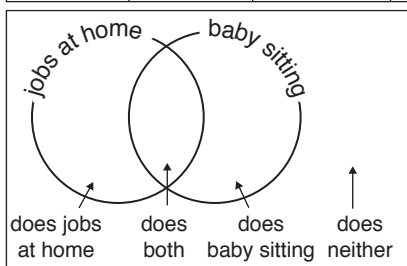
$12 + 2 =$

**b)** Name the children who love ice cream but not yogurt.

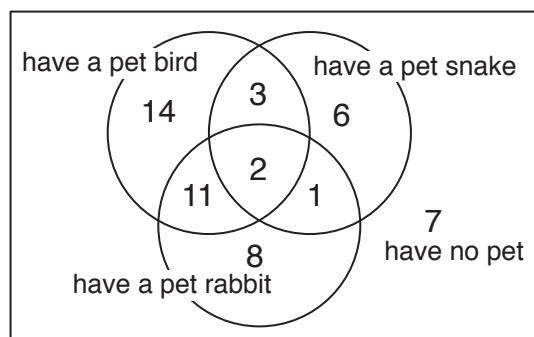


**c)** Use the data in the table to correctly place each person's initial on the Venn diagram.

Name	does jobs at home	does baby sitting	does both
Kai (K)			✓
Edwin (E)		✓	
May (M)			✓
Fiona (F)	✓		



**d)** Thirty children have a pet bird. How many of those children also have a pet snake and a pet rabbit?



## Skill 21.7 Calculating the probability of a simple event.

- Find the number of favorable outcomes for the event.
- Find the total number of possible outcomes.
- Divide the number of favorable outcomes by the number of possible outcomes. (see skill 21.3, page 183)

$$\text{Probability of an event} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Probability  
as a fraction

- Q.** What is the probability of rolling a number greater than 2 with one roll of a die? [Give the answer as a fraction.]



**A.**  $\frac{2}{3}$

There are 6 faces on a die, so there are six possible outcomes.

The numbers greater than 2 are 3, 4, 5 and 6, so there are four favorable outcomes. The probability of rolling a number greater than 2 is:

$$\frac{FO}{PO} = \frac{4}{6}$$

← there are 4 numbers greater than 2  
← there are 6 possible numbers

$$\text{or } \frac{4 \div 2}{6 \div 2} = \frac{2}{3} \text{ after simplifying.}$$

- a)** What is the probability of drawing a Queen from a standard deck of playing cards?

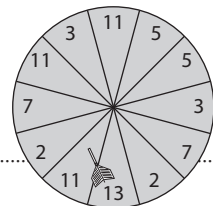
$$\frac{FO}{PO} = \frac{4 \div 4}{52 \div 4} = \frac{1}{13}$$



$$\frac{1}{13}$$

- b)** What is the probability of throwing a dart inside an 11 point area when you hit the dart board?

$$\frac{FO}{PO} = \frac{3 \div 3}{12 \div 3} =$$



$$\frac{\quad}{\quad}$$

- c)** Each letter in PROBABILITY is written on a separate piece of paper and put into a bag. If a piece of paper is randomly selected from the bag, what is the probability of choosing a consonant?

$$\frac{FO}{PO} =$$

$$\frac{\quad}{\quad}$$

- d)** A box has 10 chocolate, 10 plain and 12 creamed biscuits. If a biscuit is randomly selected from the box, what is the probability of choosing a plain biscuit?

$$\frac{FO}{PO} =$$

$$\frac{\quad}{\quad}$$

- e)** A money bag contains twenty dimes and sixty nickels. A coin is randomly selected from the bag. What is the probability of a dime being selected?

$$\frac{FO}{PO} =$$

$$\frac{\quad}{\quad}$$

- f)** A deck of cards has 5 navy, 5 yellow and 5 black cards. A card is randomly picked from the deck. What is the probability of a black card being picked?

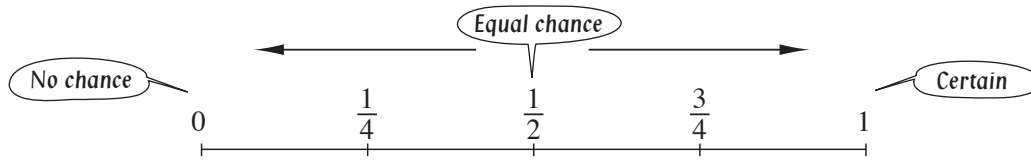
$$\frac{FO}{PO} =$$

$$\frac{\quad}{\quad}$$

## Skill 21.8 Understanding probability as a number between 0 and 1.

MMYellow 1 1 2 2 3 3 4 4  
MMRed 1 1 2 2 3 3 4 4

$$\text{Probability of an event} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$



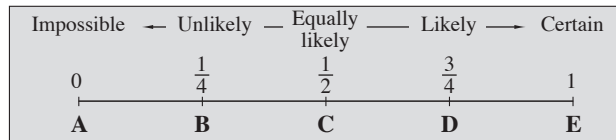
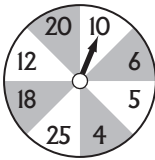
**Hint:** Probabilities range from 0 to 1.

The closer the probability is to 1, the more likely the event is to happen.

The closer the probability is to 0, the more unlikely the event is to happen.

- Q.** Which letter A to E best represents the probability of the event?

"An even number is the result when the spinner is spun."



- A. D**

The even numbers on the spinner are 10, 6, 4, 18, 12 and 20, so there are six ways to spin an even number so there are 6 favorable outcomes (FO).

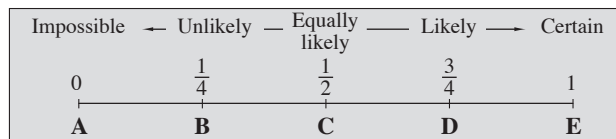
There are 8 sections on the spinner, so there are 8 possible outcomes (PO).

The probability (Pr) of spinning an even number is six out of eight:

$$\frac{FO}{PO} = \frac{6}{8} = \frac{3}{4} \text{ after simplifying.}$$

- a)** Which letter A to E best represents the probability of the event?

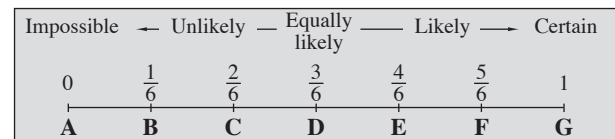
"An odd number is drawn at random from the numbers 20 to 29."



$$FO = 5, PO = 10, Pr = \frac{5}{10} \quad \boxed{C}$$

- b)** Which letter A to G best represents the probability of the event?

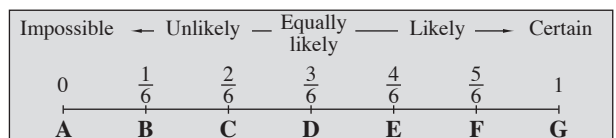
"A number less than 6 turns up when a die is rolled."



$$FO = \quad, PO = \quad, Pr = \quad \quad \boxed{\quad}$$

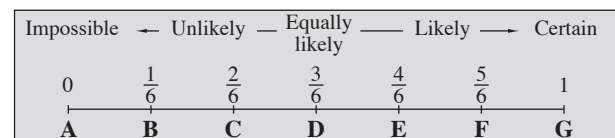
- c)** Which letter A to G best represents the probability of the event?

"A number greater than 5 turns up when a die is rolled."



- d)** Which letter A to G best represents the probability of the event?

"A prime number is drawn at random from the numbers 10 to 15."



## Skill 21.9 Finding the median of a set of data.

- Arrange the numbers in the set of data in order from smallest to largest.
- Find the middle number.

When there is an **odd** number of terms in the set of data there is only one middle number. That middle number is the median.

When there is an **even** number of terms in the set of data there are two middle terms. The median is half way between the two terms (the average of the two middle terms).

- Q.** This table shows all possible letter scores in Scrabble. What is the median letter score in Scrabble?

Scrabble Letter Scores							
0	1	2	3	4	5	8	10

- A.** **3.5**



List the numbers in order. Because there are eight numbers in the data, there are two middle numbers, 3 and 4. The median score is the average of 3 and 4 or the number half way between 3 and 4.

- a)** Arrange the gestation time for these animals in order. What is the median gestation time?

Gestation Time (days)						
Camel	Dog/cat	Cow	Whale	Sheep	Elephant	Rabbit
406	62	280	365	148	640	32

32, 62, 148, 280, 365, 406, 640

days

- b)** Arrange the lifespans in order. What is the median lifespan?

Life Span (years)				
Great Dane	Doberman	Ball Python	Guinea Pig	Cat (indoor)
10	15	40	7	18

years

- c)** Arrange the heights of the five NBA basketballers in order. What is the median height?

Heights of NBA Basketball Players				
D. Howard	D. Jones	I. Diogu	A. Bogut	J. Crawford
6'11"	6'3"	6'8"	7'0"	6'5"

' "

- e)** Consider the data: 2, 5, 10, 12, 17, 9, 3  
What is the median?

- d)** Arrange the number of known moons in our solar system in order. What is the median number of moons?

Known Number of Moons in our Solar System								
Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
0	0	1	2	63	47	27	13	1

- f)** Consider the data: 42, 46, 55, 43, 54, 48  
What is the median?

- List the numbers in order.
- Look for the number that occurs most often.

**Q.** Consider the data: 2, 10, 7, 9, 7, 1  
Which statement is true?

- A) The mode is 6.
- B) The median is 6.
- C) The mean is 6.

**A. C**

List the numbers in order.

1 2 7 7 9 10

A) The number that occurs most often is 7, so the mode is 7. Statement A) is false.

B) There are two middle numbers in the data, so the median is 7. Statement B) is false.

1 2 7 7 9 10  
7

C) Add all the numbers together:

$$1 + 2 + 7 + 7 + 9 + 10 = 36$$

There are six numbers in the data.

Divide the total by 6:  $36 \div 6 = 6$

so the mean is 6. Statement C) is true.

**a)** Consider the data: 19, 18, 16, 18, 19, 18  
What is the mode?

**b)** Consider the data: 6, 6, 7, 6, 7, 8, 7, 6  
What is the mode?

**c)** Consider the data: 5, 15, 10, 15, 5, 10, 10  
Which statement is true?

- A) The mode is 5.
- B) The median is 15.
- C) The mean is 10.

*Ordered data:*

*Mean =*

*Median = , Mode =*

**d)** Consider the data: 4, 3, 5, 2, 6, 8, 1, 3  
Which statement is true?

- A) The mean is 3.
- B) The median is 4.
- C) The mode is 3.

*Ordered data:*

*Mean =*

*Median = , Mode =*

**e)** Consider the data: 7, 8, 7, 8, 5, 8, 6  
Which statement is true?

- A) The mean is 8.
- B) The median is 8.
- C) The mode is 8.

*Ordered data:*

*Mean =*

*Median = , Mode =*

**f)** Consider the data: 6, 8, 5, 13, 11, 6, 7  
Which statement is true?

- A) The mean is 7.
- B) The median is 7.
- C) The mode is 7.

*Ordered data:*

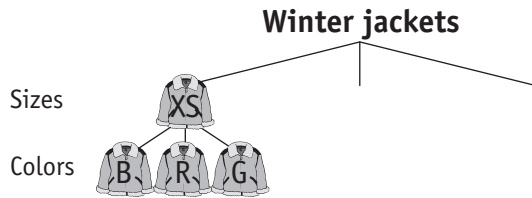
*Mean =*

*Median = , Mode =*

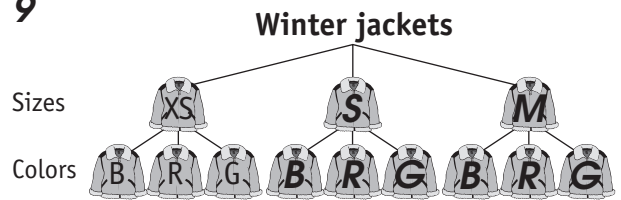
**Skill 21.11** Interpreting tree diagrams.

- List the choices for one category.
- Then take one of those choices and link it to the list of choices for the next category.

**Q.** A winter jacket comes in three sizes, extra small (XS), small (S) and medium (M). There are three colors to choose from: black, red and green. How many choices of jackets are available? [Complete the tree diagram to help you solve the problem.]



**A. 9**



To complete the tree diagram, start at the top. The first choice is size.

List the sizes: XS, S and M.

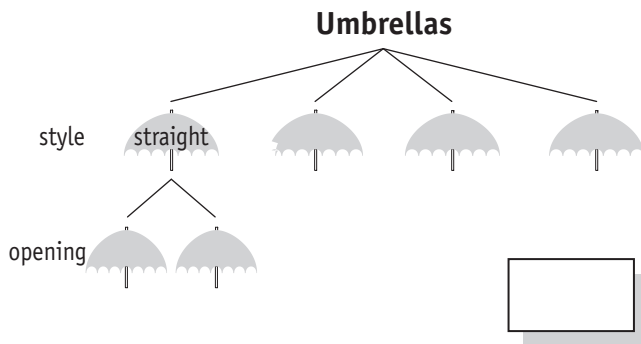
Then list the colors for each size. Each branch represents a choice or a possible outcome:

XS black, XS red, XS green

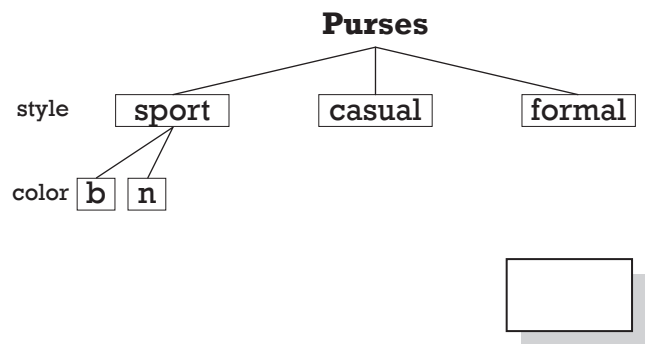
S black, S red, S green

M black, M red, M green

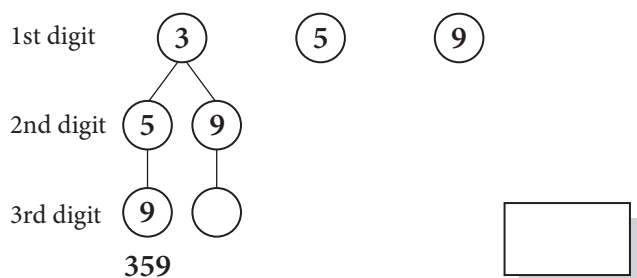
**a)** Umbrellas are sold in four styles, straight, golf, 2-folded and 3-folded. They can be manual (M) and automatic (A). How many choices of umbrellas are available? [Complete the tree diagram to help you solve the problem.]



**b)** A shop is selling three styles of purses (sport, casual and formal). Each style comes in four colors (black, navy, red and white). How many combinations of purses are sold? [Complete the tree diagram to help you solve the problem.]



**c)** How many different three-digit numbers can be made using the digits 3, 5 and 9? [Complete the tree diagram to help you solve the problem.]



**d)** How many different three-digit numbers greater than 200 can be made using the digits 1, 4 and 8? [Complete the tree diagram to help you solve the problem.]

