

## حل تجميعية أسئلة مراجعة حسب الهيكل الوزاري منهج ريفيل



### تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف السابع ← رياضيات ← الفصل الثالث ← ملفات متنوعة ← الملف

تاريخ إضافة الملف على موقع المناهج: 2025-06-04 16:38:11

ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل  
منهج انجليزي | ملخصات وتقارير | مذكرات وبنوك | الامتحان النهائي | للمدرس

المزيد من مادة  
رياضيات:

### التواصل الاجتماعي بحسب الصف السابع



صفحة المناهج  
الإماراتية على  
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

### المزيد من الملفات بحسب الصف السابع والمادة رياضيات في الفصل الثالث

نموذج تدريبي للاختبار النهائي وفق الهيكل الوزاري	1
نماذج أسئلة من اختبارات سابقة على نمط الهيكل الوزاري	2
نماذج أسئلة امتحانات وزارية سابقة	3
تجميعية أسئلة نهائية وفق الهيكل الوزاري حسب منهج بريدج	4
تجميعية أسئلة وتدريبات حسب الهيكل الوزاري منهج ريفيل	5

## Grade 7 General

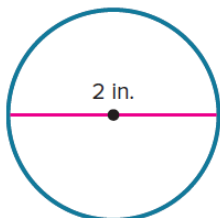
### EOT Term 3 Coverage Solutions

حل أسئلة هيكل اختبار الرياضيات للصف  
السابع العام ريفيل

## Part 1: Multiple Choice Questions (MCQ): Questions 1-15

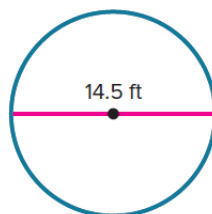
1	Find the circumferences of circles given the radius or diameter using the formulas for the circumference	(1-6)	455
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- Find the circumference of the watch face. Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 1)
- A circular fence is being used to surround a dog house. How much fencing is needed to build the fence? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 1)



**SOLUTION:**

$$\begin{aligned} C &= \pi d \\ C &= \pi(2) \\ C &= 2\pi \\ C &\approx 2(3.14) \\ C &\approx 6.28 \end{aligned}$$



**SOLUTION:**

$$\begin{aligned} C &= \pi d \\ C &= \pi(14.5) \\ C &= 14.5\pi \\ C &\approx 14.5(3.14) \\ C &\approx 45.53 \end{aligned}$$

- Find the circumference of a circle with a radius of  $31\frac{1}{2}$  yards. Use 3.14 for  $\pi$ . Write your answer as a decimal rounded to the nearest hundredth. (Example 2)
- Find the circumference of a circle with a radius of 4.4 inches. Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 2)

**SOLUTION:**

$$\begin{aligned} C &= 2\pi r \\ C &= 2\pi\left(31\frac{1}{2}\right) \\ C &= 63\pi \\ C &\approx 63(3.14) \\ C &\approx 197.82 \end{aligned}$$

**SOLUTION:**

$$\begin{aligned} C &= 2\pi r \\ C &= 2\pi(4.4) \\ C &= 8.8\pi \\ C &\approx 8.8(3.14) \\ C &\approx 27.63 \end{aligned}$$

- The world's largest flower, the Rafflesia, has a circumference of 286 centimeters. Find the approximate diameter of the flower. Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 3)
- A helicopter pad has a circumference of  $47\frac{1}{2}$  yards. Find the approximate diameter of the helicopter pad. Use 3.14 for  $\pi$ . Write your answer as a decimal rounded to the nearest hundredth if necessary. (Example 3)

**SOLUTION:**

$$\begin{aligned} d &= \frac{C}{\pi} \\ d &\approx \frac{286}{3.14} \\ d &\approx 91.08 \end{aligned}$$

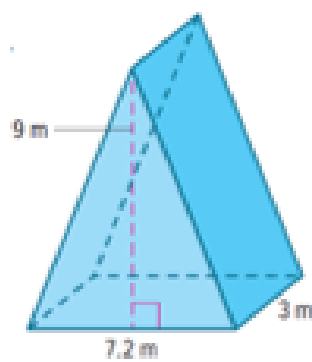
**SOLUTION:**

$$\begin{aligned} &\text{Express } 47\frac{1}{2} \text{ as } 47.5. \\ d &= \frac{C}{\pi} \\ d &\approx \frac{47.5}{3.14} \\ d &\approx 15.13 \end{aligned}$$

2	Find volumes of prisms and pyramids by using formulas for volume of prisms and pyramids	(3-6)	485
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Find the volume of each figure. Round to the nearest tenth if necessary. (Examples 2 and 3)

3.



$$V = Bh$$

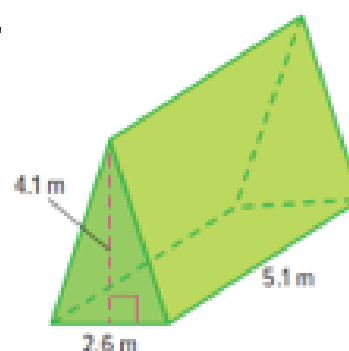
$$V = \left(\frac{1}{2} \cdot 7.2 \cdot 9\right)h$$

$$V = (32.4)h$$

$$V = (32.4)3$$

$$V = 97.2$$

4.



**SOLUTION:**

$$V = Bh$$

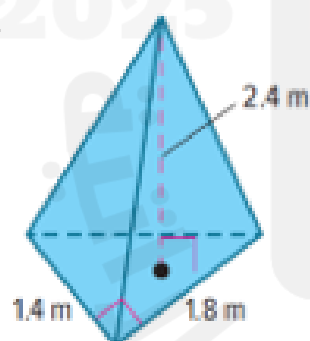
$$V = \left(\frac{1}{2} \cdot 2.6 \cdot 4.1\right)h$$

$$V = (5.33)h$$

$$V = (5.33)5.1$$

$$V = 27.2$$

5.



**SOLUTION:**

$$V = \frac{1}{3}Bh$$

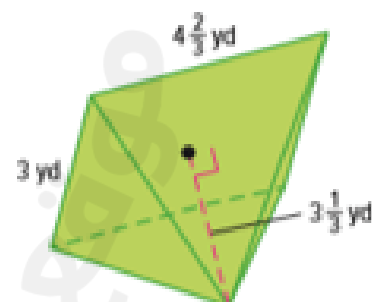
$$V = \frac{1}{3}\left(\frac{1}{2} \cdot 1.4 \cdot 1.8\right)h$$

$$V = \frac{1}{3}(1.26)h$$

$$V = \frac{1}{3}(1.26)2.4$$

$$V = 1.0$$

6.



**SOLUTION:**

$$V = \frac{1}{3}Bh$$

$$V = \frac{1}{3}(\ell w)h$$

$$V = \frac{1}{3}\left(4\frac{2}{3} \cdot 3\right)3\frac{1}{3}$$

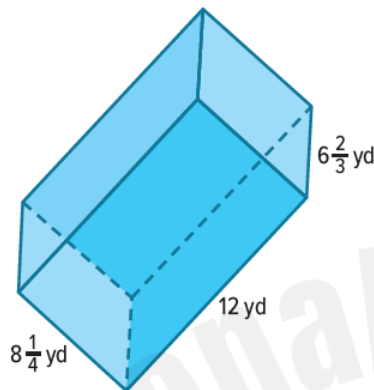
$$V = 15.6$$

3	Find the surface areas of solids to the formulas for surface area	(1,2,5,6)	495
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Find the surface area of each prism. Round to the nearest tenth if necessary.

(Example 1)

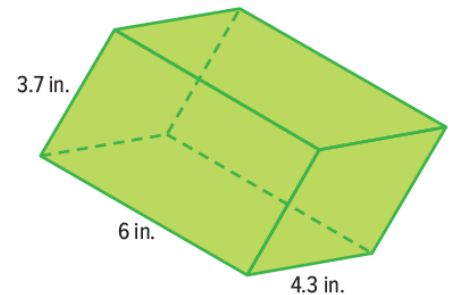
1.



**SOLUTION:**

$$\begin{aligned}
 S.A. &= 2\ell h + 2\ell w + 2hw \\
 &= 2(12 \cdot 6\frac{2}{3}) + 2(12 \cdot 8\frac{1}{4}) + 2(6\frac{2}{3} \cdot 8\frac{1}{4}) \\
 &= 160 + 198 + 110 \\
 &= 468
 \end{aligned}$$

2.

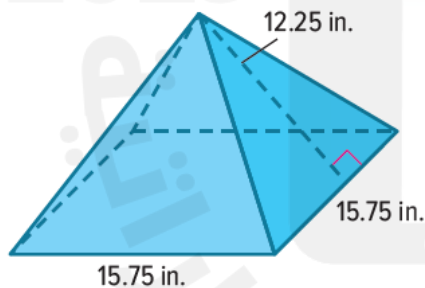


**SOLUTION:**

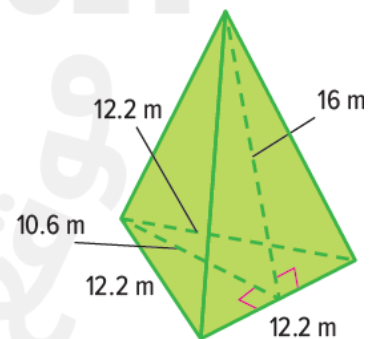
$$\begin{aligned}
 S.A. &= 2\ell h + 2\ell w + 2hw \\
 &= 2(6 \cdot 3.7) + 2(6 \cdot 4.3) + 2(3.7 \cdot 4.3) \\
 &= 44.4 + 51.6 + 31.82 \\
 &= 127.82 \\
 &= 127.8
 \end{aligned}$$

Find the surface area of each pyramid. Round to the nearest tenth if necessary. (Example 3)

5.



6.



**SOLUTION:**

Find the area of the base.

$$\begin{aligned}
 A &= s^2 \\
 &= 15.75 \cdot 15.75 \\
 &= 248.0625
 \end{aligned}$$

Area of a square  
Each side is 15.75.  
Multiply.

The area of the base is 248.0625 square inches.

Find the area of the 4 lateral faces.

$$\begin{aligned}
 A &= 4(\frac{1}{2}bh) \\
 &= 4(\frac{1}{2} \cdot 15.75 \cdot 12.25) \\
 &= 4(96.46875) \\
 &= 385.875
 \end{aligned}$$

There are 4 lateral faces with an area of  $\frac{1}{2}bh$ .  
Replace  $b$  with 15.75 and  $h$  with 12.25.  
Multiply.  
Multiply.

The area of the lateral faces is 385.875 square inches.

Find the total surface area of the pyramid.

$$\begin{aligned}
 248.0625 + 385.875 &= 633.9375 \\
 &= 633.9
 \end{aligned}$$

Round to the nearest tenth.

The total surface area of the pyramid is 633.9 square inches.

**SOLUTION:**

Find the area of the base.

$$\begin{aligned}
 A &= \frac{1}{2}bh \\
 &= \frac{1}{2} \cdot 12.2 \cdot 10.6 \\
 &= 64.66
 \end{aligned}$$

Area of a triangle

Replace  $b$  with 12.2 and  $h$  with 10.6.

Multiply.

The area of the base is 64.66 square meters.

Find the area of the 3 lateral faces.

$$\begin{aligned}
 A &= 3(\frac{1}{2}bh) \\
 &= 3(\frac{1}{2} \cdot 12.2 \cdot 16) \\
 &= 3(97.6) \\
 &= 292.8
 \end{aligned}$$

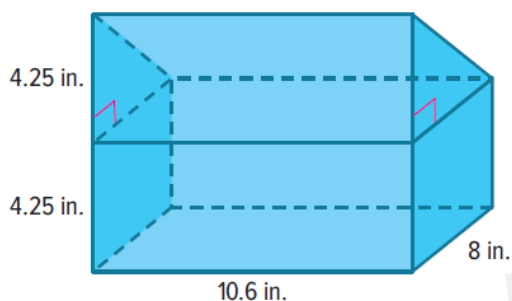
There are 3 lateral faces with an area of  $\frac{1}{2}bh$ .  
Replace  $b$  with 12.2 and  $h$  with 16.  
Multiply.  
Add.

The area of the lateral faces is 292.8 square meters.

Find the total surface area.

$$64.66 + 292.8 = 357.46$$

1. Mya's lunchbox is shown. What is the volume of the lunchbox? Round to the nearest tenth if necessary. (Example 1)



**Rectangular Prism**

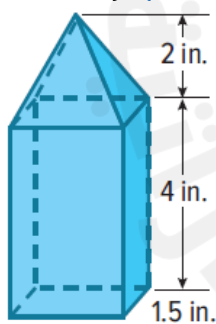
$$\begin{aligned} V &= Bh \\ &= (10.6 \cdot 8)4.25 \\ &= 360.4 \end{aligned}$$

**Triangular Prism**

$$\begin{aligned} V &= Bh \\ &= \left(\frac{1}{2} \cdot 8 \cdot 4.25\right)10.6 \\ &= 180.2 \end{aligned}$$

So, the total volume of the lunchbox is about 360.4 cubic inches + 180.2 cubic inches or 540.6 cubic inches.

3. What is the volume of the birdfeeder? Round to the nearest tenth if necessary. (Example 1)



**Rectangular Prism**

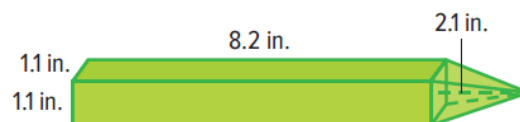
$$\begin{aligned} V &= Bh \\ &= (2 \cdot 1.5)4 \\ &= 12 \end{aligned}$$

**Triangular Prism**

$$\begin{aligned} V &= \frac{1}{3}Bh \\ &= \frac{1}{3}(2 \cdot 1.5)2 \\ &= 2 \end{aligned}$$

So, the total volume of the birdfeeder is 12 cubic inches + 2 cubic inches or 14 cubic inches.

2. Anson's toy rocket is shown. What is the volume of the rocket? Round to the nearest tenth if necessary. (Example 1)



**Rectangular Prism**

$$\begin{aligned} V &= Bh \\ &= (8.2 \cdot 1.1)1.1 \\ &= 9.922 \end{aligned}$$

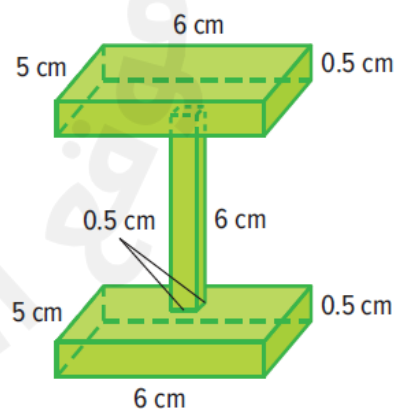
**Triangular Prism**

$$\begin{aligned} V &= \frac{1}{3}Bh \\ &= \frac{1}{3}(1.1 \cdot 1.1)2.1 \\ &= 0.847 \end{aligned}$$

Find the total volume of the rocket.

$$\begin{aligned} 9.922 + 0.847 &= 10.769 \\ &= 10.8 \end{aligned}$$

4. Zahir made this wooden perch for his pet bird. What is the volume of the bird perch? Round to the nearest tenth if necessary. (Example 1)



**Rectangular Prism**

$$\begin{aligned} V &= Bh \\ &= (0.5 \cdot 0.5)6 \\ &= 1.5 \end{aligned}$$

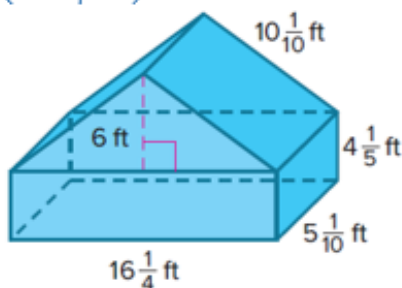
**Rectangular Prisms**

$$\begin{aligned} V &= 2Bh \\ &= 2(6 \cdot 5)0.5 \\ &= 30 \end{aligned}$$

So, the total volume of the perch is 1.5 cubic centimeters + 30 cubic centimeters or 31.5 cubic centimeters.

5. Find the surface area of the composite figure. Round to the nearest tenth if necessary.

(Example 2)



**SOLUTION:**

The figure is composed of a rectangular prism and a triangular prism.

Find the areas of the 5 faces of rectangular prism.

$$\text{Area of sides: } 2\left(5\frac{1}{10} \cdot 4\frac{1}{5}\right) = 42.84 \text{ ft}^2$$

$$\text{Area of bottom: } \left(16\frac{1}{4} \cdot 5\frac{1}{10}\right) = 82.875 \text{ ft}^2$$

$$\text{Area of front and back: } 2\left(16\frac{1}{4} \cdot 4\frac{1}{5}\right) = 136.5 \text{ ft}^2$$

The surface area the faces of rectangular prism is 262.215 square feet.

Find the areas of the 4 faces of the triangular prism.

In this triangular prism, there are two congruent triangular bases.

Area Bases:

$$A = 2\left(\frac{1}{2} \cdot 16\frac{1}{4} \cdot 6\right) = 97.5 \text{ ft}^2$$

Area of the two congruent rectangular faces.

$$A = 2\left(10\frac{1}{10} \cdot 5\frac{1}{10}\right) = 103.2 \text{ ft}^2$$

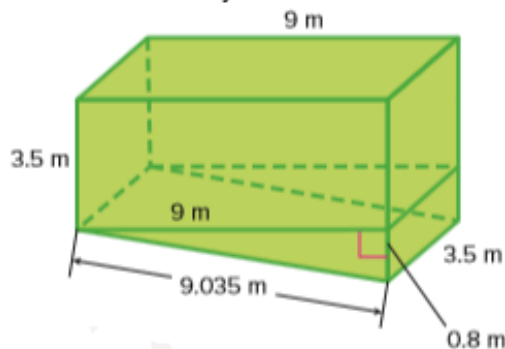
Find the sum of the areas of the faces.

$$262.215 + 97.5 + 103.2 = 462.735 = 462.7$$

Round to the nearest tenth.

The surface area the composite figure is 462.7 square feet.

6. **Open Response** Find the surface area of the composite figure. Round to the nearest tenth if necessary.



**SOLUTION:**

The figure is composed of a rectangular prism and a triangular prism.

Find the areas of the 5 faces of rectangular prism.

$$\text{Area of sides: } 2(3.5 \cdot 3.5) = 24.5 \text{ m}^2$$

$$\text{Area of top: } (9 \cdot 3.5) = 31.5 \text{ m}^2$$

$$\text{Area of front and back: } 2(9 \cdot 3.5) = 63 \text{ m}^2$$

The surface area the faces of rectangular prism is 119 square meters.

Find the areas of the 4 faces of the triangular prism. In this triangular prism,

Area Bases:

there are two congruent triangular bases.

$$A = 2\left(\frac{1}{2} \cdot 9.035 \cdot 0.8\right) = 7.2 \text{ m}^2$$

Area of the side rectangular face

$$A = (3.5 \cdot 0.8) = 2.8 \text{ m}^2$$

Area of the side bottom face

$$A = (9.035 \cdot 3.5) = 31.6 \text{ m}^2$$

Find the sum of the areas of the faces.

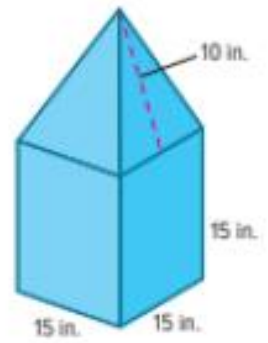
$$119 + 7.2 + 2.8 + 31.6 = 160.6$$

The surface area the composite figure is 160.6 square meters.



## Apply

7. For a charity drive, each classroom is given a coin box made of cardboard like the one shown. The student council wants to construct a version of the coin box that has a scale factor of 3 times the classroom coin box. Is 100 square feet of cardboard enough to build the new coin box? Write an argument that can be used to defend your solution.



### SOLUTION:

In the coinbox, there are five square faces and four triangular faces.

Find the areas of the 5 squares.

$$\begin{aligned} A &= 5s^2 \\ &= 5(15)^2 \\ &= 1,125 \text{ in}^2 \end{aligned}$$

Find the areas of the 4 triangular faces.

$$\begin{aligned} A &= 4\left(\frac{1}{2}bh\right) \\ &= 4\left(\frac{1}{2} \cdot 15 \cdot 10\right) \\ &= 330 \text{ in}^2 \end{aligned}$$

The total surface area the coinbox is 1,125 square inches + 330 square inches or 1,425 square inches.

Convert 1,425 square inches to square feet. There are 144 square inches in 1 square foot.

$$1,425 \div 144 \approx 9.89$$

The total surface area the coinbox is about 9.89 square feet.

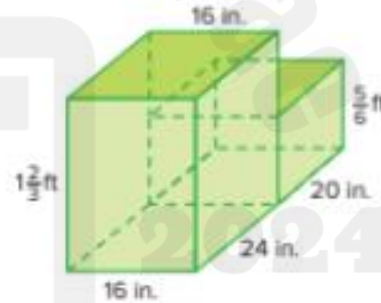
Find the surface area of the new version.

$$\begin{aligned} S.A. &= 9.89 \times 32 \\ &= 89.01 \end{aligned}$$

Multiply the area by the square of the scale factor.  
Simplify.

The new version of the coin box has a surface area of 89.01 square feet. Because  $89.01 < 100$  there is enough cardboard available.

8. Jake wants to buy the foam gymnastic block shown. If the foam used to make the gymnastic block costs \$24.99 per cubic foot, what is the cost of this block, to the nearest dollar?



### SOLUTION:

Convert  $1\frac{2}{3}$  feet and  $\frac{5}{6}$  feet to inches. There are 12 inches 1 foot.

$$1\frac{2}{3} \times 12 = 20 \text{ inches}$$

$$\frac{5}{6} \times 12 = 10 \text{ inches}$$

The figure is composed of two rectangular prisms. Find the volume each prism.

#### Rectangular Prism 1

$$\begin{aligned} V &= Bh \\ &= (16 \cdot 24)20 \\ &= 7,680 \text{ in}^3 \end{aligned}$$

#### Rectangular Prism 2

$$\begin{aligned} V &= Bh \\ &= (16 \cdot 20)10 \\ &= 3,200 \text{ in}^3 \end{aligned}$$

The total volume is 7,680 cubic inches + 3,200 cubic inches or 10,880 cubic inches.

Convert 10,880 cubic inches to cubic feet. There are 1,728 cubic inches in 1 cubic foot.

$$10,880 \div 1,728 = 6.3$$

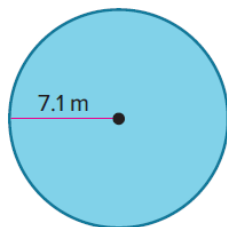
The total volume is about 6.3 cubic feet.

So, the total cost is  $\$24.99 \times 6.3$  or \$157.



5	Find the areas of circles given the radius or diameter using the formula for the area of a circle	(1-6)	465
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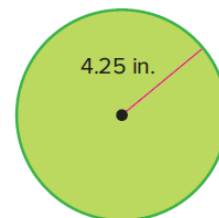
1. Find the area of the circle. Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 1)



**SOLUTION:**

$$\begin{aligned}
 A &= \pi r^2 \\
 A &= \pi(7.1)^2 \\
 A &= 50.41\pi \\
 A &\approx 50.41(3.14) \\
 A &\approx 158.29
 \end{aligned}$$

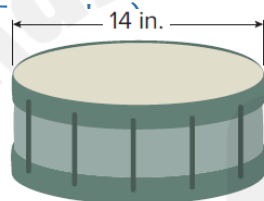
2. Find the area of the circle. Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 1)



**SOLUTION:**

$$\begin{aligned}
 A &= \pi r^2 \\
 A &= \pi(4.25)^2 \\
 A &= 18.0625\pi \\
 A &\approx 18.0625(3.14) \\
 A &\approx 56.72
 \end{aligned}$$

3. What is the area of the drumhead on the drum? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Ex



**SOLUTION:**

$$\begin{aligned}
 A &= \pi r^2 \\
 A &= \pi(7)^2 \\
 A &= 49\pi \\
 A &\approx 49(3.14) \\
 A &\approx 153.86
 \end{aligned}$$

4. What is the area of one side of the penny? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Ex

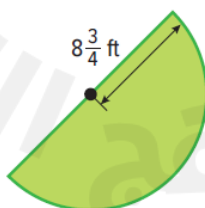


**SOLUTION:**

The radius is  $19 \div 2$  or 9.5 millimeters.

$$\begin{aligned}
 A &= \pi r^2 \\
 A &= \pi(9.5)^2 \\
 A &= 90.25\pi \\
 A &\approx 90.25(3.14) \\
 A &\approx 283.39
 \end{aligned}$$

5. Mr. Ling is adding a pond in the shape of a semicircle in his backyard. What is the area of the pond? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 3)

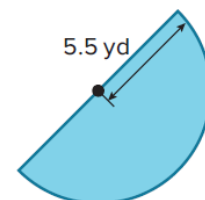


**SOLUTION:**

The radius is  $19 \div 2$  or 9.5 millimeters.

$$\begin{aligned}
 A &= \frac{1}{2} \pi r^2 \\
 A &= \frac{1}{2} \pi (8.75)^2 \\
 A &= 38.28125\pi \\
 A &\approx 38.28125(3.14) \\
 A &\approx 120.20
 \end{aligned}$$

6. Vidur needs to buy mulch for his garden. What is the area of his garden? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 3)

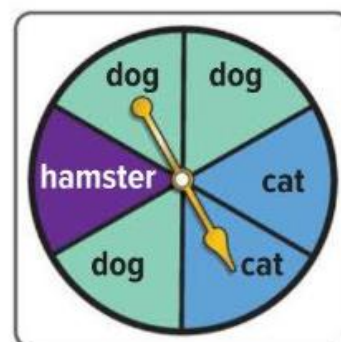


**SOLUTION:**

$$\begin{aligned}
 A &= \frac{1}{2} \pi r^2 \\
 A &= \frac{1}{2} \pi (5.5)^2 \\
 A &= 15.125\pi \\
 A &\approx 15.125(3.14) \\
 A &\approx 47.49
 \end{aligned}$$

6	Describe the likelihood of an event as impossible, unlikely, equally likely to happen as not to happen, likely, or certain.	(1-8)	513
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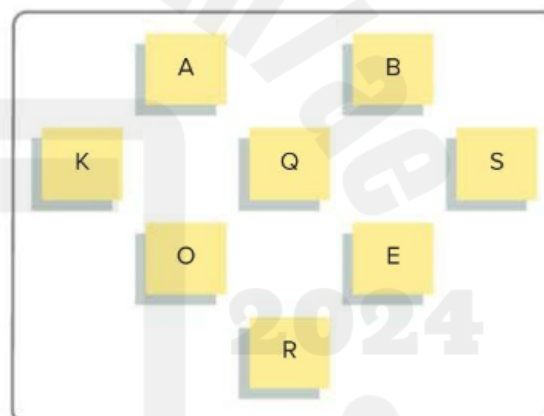
The spinner shown is spun once. Classify the likelihood of each event as *impossible*, *unlikely*, *equally likely*, *likely*, or *certain*. (Example 1)



- the spinner landing on *dog* , the event is equally likely.
- the spinner landing on *hamster* the event is unlikely.
- the spinner landing on *dog* or *cat* the event is likely.
- the spinner landing on *bird* impossible.
- the spinner landing on an animal certain.
- the spinner landing on *cat* or *hamster* , the event is equally likely.

For Exercises 7 and 8, a card is randomly selected from the ones shown.

7. **Multiselect** Select all events that are unlikely to happen.



- ☐ selecting the letter B
- ☐ selecting the letter T
- ☐ selecting a vowel or S
- ☐ selecting a consonant or vowel
- ☐ selecting a consonant or A
- ☐ selecting the letter Q or R

**SOLUTION:**

There are 7 cards shown.

selecting the letter B: 1 card is labeled B. So, event is unlikely.

selecting the letter T: T is not shown. So, the event is impossible.

selecting a vowel or S: 4 cards are a vowel or S. So, the event is equally likely.

selecting a consonant or vowel: All cards are a consonant or vowel. So, the event is certain.

selecting a consonant or A: 6 cards are a consonant or A. So, the event is likely.

selecting the letter Q or R: 2 cards are a Q or R. So, the event is unlikely.

The unlikely events are selecting the letter B and selecting the letter Q or R.

**8. Multiselect** Select all of the following events that are equally likely to happen as not to happen.

- ☐ selecting the letter B
- ☐ selecting the letter E
- ☐ selecting a vowel or S
- ☐ selecting a consonant or vowel
- ☐ selecting a consonant or A
- ☐ selecting the letter Q, R, B, or K

**SOLUTION:**

There are 7 cards shown.

selecting the letter B: 1 card is labeled B. So, event is unlikely.

selecting the letter E: 1 card is labeled E. So, event is unlikely.

selecting a vowel or S: 4 cards are a vowel or S. So, the event is equally likely.

selecting a consonant or vowel: All cards are a consonant or vowel. So, the event is certain.

selecting a consonant or A: 6 cards are a consonant or A. So, the event is likely.

selecting the letter Q, R, B, or K: 4 cards are Q, R, B, or K. So, the event is equally likely.

The events that are equally likely are selecting a vowel or S and selecting the letter Q, R, B, or K.

7	Find the relative frequency of an event and use it to predict the chance of that event occurring in the future	(1-5)	527
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1. A spinner with four equal sections of blue, green, yellow, and red is spun 100 times. It lands on blue 14 times, green 10 times, yellow 8 times, and red 68 times. What is the relative frequency of landing on red? green? (Example 1)

**SOLUTION:**

$$\text{relative frequency of rolling a red} = \frac{\text{number of times red occurred}}{\text{total number of spins}} = \frac{68}{100}$$

The relative frequency of rolling a red is 68%, 0.68, or  $\frac{17}{25}$ .

$$\text{relative frequency of rolling a green} = \frac{\text{number of times green occurred}}{\text{total number of spins}} = \frac{10}{100} = 10\%$$

The relative frequency of rolling a green is 10%, 0.10, or  $\frac{1}{10}$ .

2. The frequency table shows the results of a survey about favorite exhibits. (Example 2)

Find the relative frequency that a randomly selected student's favorite exhibit was either butterflies or trains, as a percent.

Exhibit	Frequency
Butterfly	12
Dinosaurs	25
Planets	17
Trains	6

**SOLUTION:**

Find the total number of students surveyed.  
 $12 + 25 + 17 + 6 = 60$  students

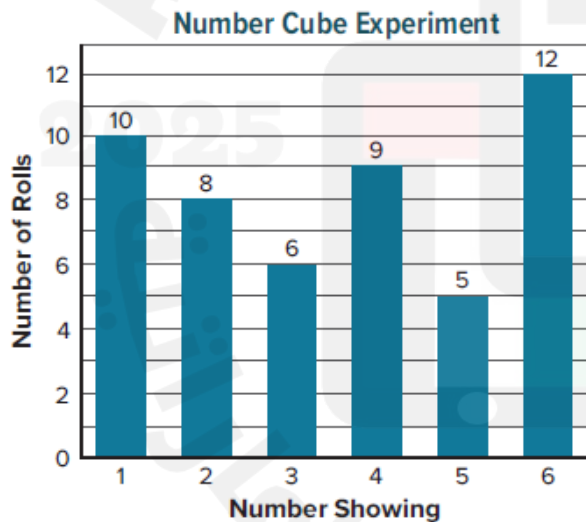
Find how many students chose butterflies or trains as their favorite exhibit.  
 $12 + 6 = 18$  students

Find the relative frequency by writing a ratio.

$$\frac{\text{number of students that chose butterflies or trains}}{\text{total number of students}} = \frac{18}{60}$$

So, the relative frequency is  $\frac{18}{60}$ , 0.3, or 30%.

3. The graph shows the results of an experiment in which a number cube labeled 1 through 6 is rolled a number of times.



Find the relative frequency of rolling a number greater than 3. (Example 3)

**SOLUTION:**

Find the total number of rolls.  
 $10 + 8 + 6 + 9 + 5 + 12 = 50$  rolls

Find how many rolls that were greater than 3.  
 $9 + 5 + 12 = 26$  rolls

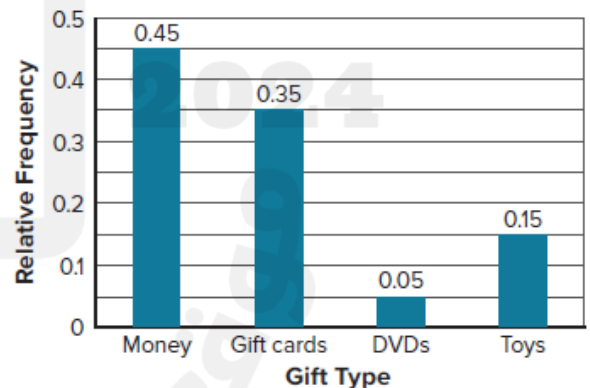
Find the relative frequency by writing a ratio.

$$\frac{\text{number of rolls of 4, 5, and 6}}{\text{total number of rolls}} = \frac{26}{50} = \frac{13}{25}$$

Simplify.

So, the relative frequency of rolling a number greater than 3 is  $\frac{13}{25}$ , 0.52, or 52%.

4. A random selection of students was asked the question "What type of gift did you last receive?" and the results were recorded in the relative frequency bar graph.



What is the experimental probability that a student chosen at random received a gift card or money? (Example 4)

**SOLUTION:**

Find the relative frequency of a gift card or money.

$$(\text{relative frequency of a gift card}) + (\text{relative frequency of money}) = 0.35 + 0.45 = 0.80$$

So, the experimental probability that a randomly chosen student received a gift card or money is 0.80, 80% or  $\frac{4}{5}$ .

**5. Open Response** Based on previous orders, the manager of an ice cream shop determines the probability that a customer will order chocolate sauce is 85%. If there are 240 sundaes ordered in one weekend, how many sundaes are expected to be ordered with chocolate sauce?

Use the relative frequency to make a prediction. Let  $s$  = the number of sundaes that are expected to be ordered with chocolate sauce out of 240.

$$\frac{85}{100} = \frac{s}{240}$$

Because 2.4 multiplied by 100 is 240 multiply 85 by 2.4.

$$\frac{85}{100} = \frac{204}{240}$$

Multiply.

So, 204 sundaes are expected to be ordered with chocolate sauce.

8	Find the theoretical probability of a simple event and its complement, and understand the relationship between them	(1-4)	537
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1. The spinner shown is spun once. What is the sample space? (Example 1)

The sample space is 1, 2, 3, 4, 5.



2. Each letter in the word MISSISSIPPI is written on a piece of paper and placed into a bag. A letter is drawn at random. What is the sample space? (Example 1)

The sample space is M, I, S, P.

3. A teacher placed the letter cards E, L, O, R, U, and W in a bag. A card is drawn at random. Determine the theoretical probability for drawing a card that has a vowel on it. (Example 2)

**SOLUTION:**

$$\begin{aligned} P(\text{vowel}) &= \frac{3}{6} \\ &= \frac{1}{2}; 0.5, 50\% \end{aligned}$$

4. A player in a board game rolls a six-sided number cube labeled 1 through 6 once. Determine the theoretical probability of rolling a 1 or 2. (Example 2)

**SOLUTION:**

$$\begin{aligned} P(1 \text{ or } 2) &= \frac{2}{6} \\ &= \frac{1}{3}, 0.\bar{3}, 33\frac{1}{3}\% \end{aligned}$$



9	Use organized lists, tables, or tree diagrams to find the sample space and probability of a compound event	(EX3,EX4),(3-5)	552,553.56
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### Example 3 Find Probabilities of Compound Events

Two number cubes, each labeled 1 through 6, are rolled.

**What is the probability of rolling a sum of 9?**

**Step 1** Find the sample space and the favorable outcomes.

Shade or circle the cells that contain two rolls with a sum of 9.

		Roll 2					
		1	2	3	4	5	6
Roll 1	1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
	2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
	3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
	4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
	5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
	6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

There are 36 possible outcomes. The table shows 4 possible outcomes that result in a sum of 9 when the two number cubes are rolled.

**Step 2** Find the probability.

$$P(\text{sum of 9}) = \frac{\text{number of outcomes with sum of 9}}{\text{number of total outcomes}}$$

$$= \frac{4}{36}$$

$$= \frac{1}{9} \approx 0.111 \text{ or about } 11.1\%$$

Write the ratio.

Substitute.

Simplify.

So, the probability of rolling a sum of 9 is  $\frac{1}{9}$ , or about 11.1%.

### Check

A coin is tossed and then a number cube labeled 1 through 6 is rolled. What is the probability of tossing tails and landing on an odd number?

Outcomes	H	T
1	H,1	T,1
2	H,2	T,2
3	H,3	T,3
4	H,4	T,4
5	H,5	T,5
6	H,6	T,6

Using table to present sample space

$$P(\text{tails and an odd number}) = \frac{3}{12}$$

$$= \frac{1}{4} \text{ or } 0.25 \text{ or } 25\%$$

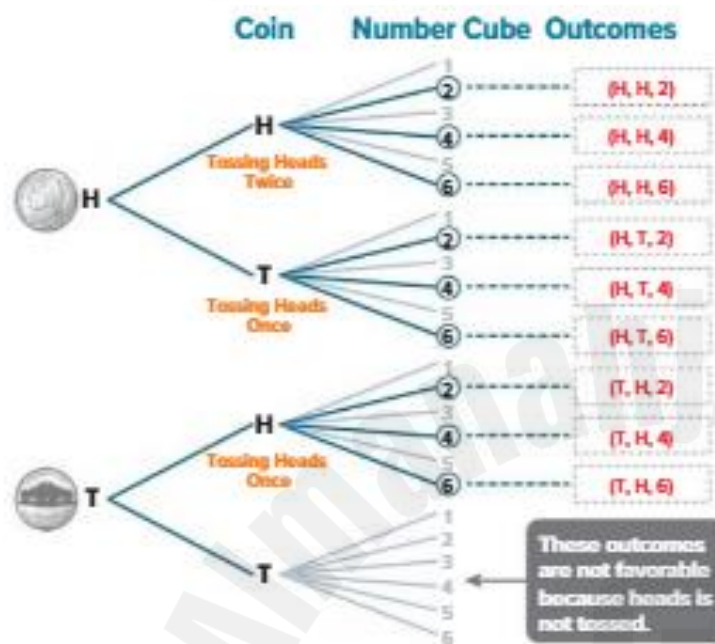
## Example 4 Find Probabilities of Compound Events

Two coins are tossed and a number cube labeled 1 through 6 is rolled.

What is the probability of tossing heads at least once and rolling an even number?

**Step 1** Find the sample space and the favorable outcomes.

Construct a tree diagram to identify the favorable outcomes.



There are 24 total possible outcomes. The diagram shows 9 possible outcomes that result in tossing heads at least once and rolling an even number.

**Step 2** Find the probability.

There are 9 out of 24 possible outcomes that are favorable.

$$P(\text{heads} \geq 1 \text{ and even}) = \frac{9}{24} = \frac{3}{8}$$

Simplify the ratio.

So, the theoretical probability of tossing at least one heads and rolling an even number is  $\frac{3}{8}$ , 0.375, or 37.5%.

## Check

A spinner with three equal-size sections labeled red, green, and yellow is spun once. Then a coin is tossed and one of two cards labeled with a 1 or a 2 is selected. What is the probability of spinning yellow, tossing heads, and selecting the number 2?

$$\frac{1}{12}, 0.08\bar{3}, 8.3\%$$



3. The spinner shown has six equal-size sections and is spun twice. What is the probability that the product of the numbers spun is 12?

(Example 3)



**SOLUTION:**

Find all the possible outcomes using a list.

$1 \times 1 = 1$	$2 \times 1 = 2$	$3 \times 1 = 3$	$4 \times 1 = 4$	$5 \times 1 = 5$	$6 \times 1 = 6$
$1 \times 2 = 2$	$2 \times 2 = 4$	$3 \times 2 = 6$	$4 \times 2 = 8$	$5 \times 2 = 10$	$6 \times 2 = 12$
$1 \times 3 = 3$	$2 \times 3 = 6$	$3 \times 3 = 9$	$4 \times 3 = 12$	$5 \times 3 = 15$	$6 \times 3 = 18$
$1 \times 4 = 4$	$2 \times 4 = 8$	$3 \times 4 = 12$	$4 \times 4 = 16$	$5 \times 4 = 20$	$6 \times 4 = 24$
$1 \times 5 = 5$	$2 \times 5 = 10$	$3 \times 5 = 15$	$4 \times 5 = 20$	$5 \times 5 = 25$	$6 \times 5 = 30$
$1 \times 6 = 6$	$2 \times 6 = 12$	$3 \times 6 = 18$	$4 \times 6 = 24$	$5 \times 6 = 30$	$6 \times 6 = 36$

Find the probability.

$$P(\text{product of 12}) = \frac{4}{36}$$

$$= \frac{1}{9}$$

There are 4 products of 12. There are 36 total outcomes.

Simplify.

The probability that the product of the numbers spun is 12 is  $\frac{1}{9}$  or 11.1%.

4. A number from 0 to 9 is randomly selected and then a letter from A to D is randomly selected. What is the probability that the number 3 and a consonant are selected? (Example 4)

**SOLUTION:**

Find all the possible outcomes using a list.

0A	1A	2A	3A	4A	5A	6A	7A	8A	9A
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C
0D	1D	2D	3D	4D	5D	6D	7D	8D	9D

Find the probability.

$P(\text{product of 4 heads}) = \frac{1}{16}$

The probability

$$= 6.3\%$$

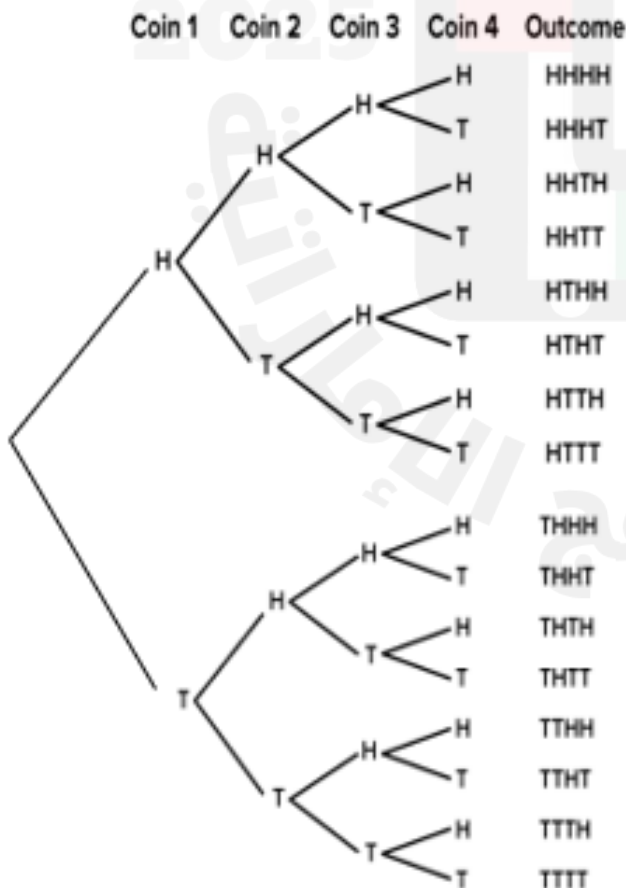
There is 1 outcome of 4 heads. There are 16 total outcomes.

Express as a percent. Round to the nearest tenth.

5. **Open Response** Lorelei tosses a coin 4 times. What is the probability of tossing four heads? Express as a percent. Round to the nearest tenth, if necessary.

**SOLUTION:**

Find all the possible outcomes using a sample space.



There is 1 outcome of 4 heads. There are 16 total outcomes.

Find the probability.

$$P(4 \text{ heads}) = \frac{1}{16} = 6.3\%$$

1. Suppose the chance of rain on Saturday is  $\frac{2}{5}$  and the chance of rain on Sunday is also  $\frac{2}{5}$ . A student wants to run a simulation to estimate the probability that it will rain on both days. (Example 1)

**Part A** How can the student model the chance of it raining on each day?  
Design a simulation.

**Part A**

Sample answer: Use a spinner with five equal-size sections. Label two sections “R” for rain and three sections “N” for no rain. The spinner is spun twice for each trial.

**Part B** Suppose the table shows the results of 10 trials of a simulation. An “R” represents a day that it rained and an “N” represents a day that it did not rain.

Trial	1	2	3	4	5	6	7	8	9	10
Saturday	N	R	R	N	N	R	R	N	R	N
Sunday	N	N	R	R	N	R	N	R	R	N

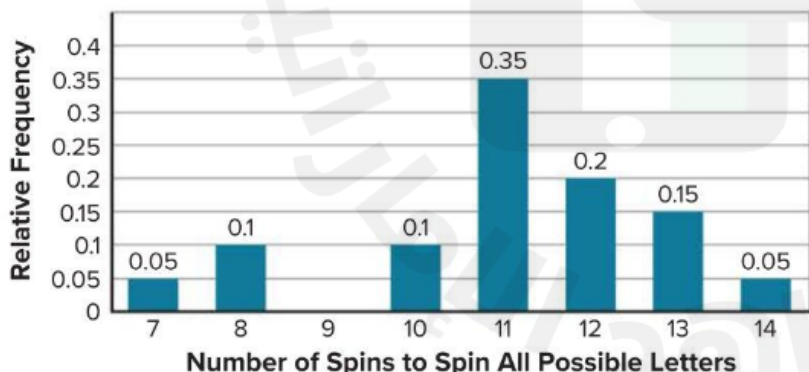
According to the results of the simulation, what is the experimental probability of having rain on both days?

**Part B**

$$P(\text{rain both days}) = \frac{3}{10}$$

There was 3 times with rain both days. There were 10 total trials.

2. **Open Response** Leigh designs and conducts a computer simulation with 30 trials and uses the data from the simulation to create the relative frequency bar graph shown. The graph shows the relative frequency of the number of spins needed for a spinner divided into 6 equal sections labeled A through F to land on each letter at least once. (Example 2)



Using the graph, what is the experimental probability that more than 10 spins are needed to land on each letter at least once? Write the probability as a percent.

**SOLUTION:**

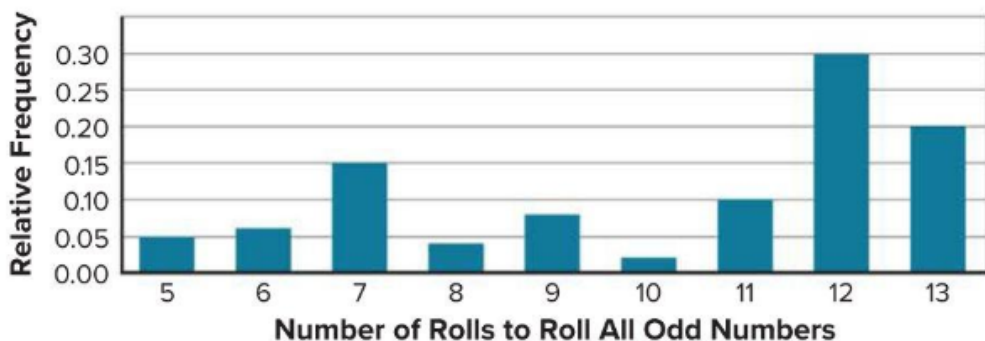
$$\begin{aligned}
 P(> 10 \text{ spins}) &= P(11) + P(12) + P(13) + P(14) \\
 &= 0.35 + 0.20 + 0.15 + 0.05 \\
 &= 0.75 \text{ or } 75\%
 \end{aligned}$$

The experimental probability is 75%.

## Apply

For Exercises 3 and 4, refer to the following information.

Nelly designs and conducts a computer simulation with 50 trials and uses the data from the simulation to create the frequency bar graph shown. The graph shows the relative frequency of the number of rolls needed for a number cube labeled 7 through 12 to roll all of the possible odd numbers.



3. How much greater is the probability that 7 or 11 rolls are needed than 13 rolls?

**SOLUTION:**

$$\begin{aligned} P(7 \text{ or } 11 \text{ rolls}) &= P(7) + P(11) \\ &= 0.15 + 0.10 \\ &= 0.25 \text{ or } 25\% \end{aligned}$$

The probability of 7 or 11 rolls is 25%.

The probability of 13 roll is 0.20 or 20%.

Find the difference between the probabilities.

$$25\% - 20\% = 5\%$$

The probability of 7 or 11 rolls is  $\frac{1}{20}$ , 0.05, or 5% greater.

4. Is the probability that 7 or 12 rolls are needed greater than the probability that all of the other rolls are needed? Explain.

**SOLUTION:**

The probability that it takes 7 or 12 rolls is 15% + 30% or 45%. The probability of all other rolls is 100% - 45% or 55%. 55% greater than 45%.

5. Use the Internet, or another source, to look up the term *fair game*. Describe a real-world scenario in which a game is fair. Then describe a real-world scenario in which a game is not fair.

**SOLUTION:**

Sample answer: A fair game could consist of tossing a coin, and winning the game is represented by tossing heads. A game that is not fair could consist of rolling a number cube labeled 1–6, and winning the game is represented by landing on the numbers 1 or 2.

6. **MP Model with Mathematics** Describe a real-world situation that can be simulated by tossing a coin and rolling a number cube. Be sure to include the number of outcomes in your description.

**SOLUTION:**

Sample answer: An ice cream shop offers 2 types of cones and 6 flavors of ice cream. To determine the probability that a customer will choose one type of cone and one flavor of ice cream, assign each one of the 12 outcomes a certain combination.

11	Identify biased and unbiased sampling methods and understand that inferences made are only valid if the sampling method is unbiased	(EX1),(1-5)	577,583
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### **Example 1** Identify Valid Sampling Methods

The astronomy association wants to take a survey to decide on the theme for their annual celebration. They are presented with three valid sampling descriptions as options to take the survey.

**For each sampling description, select the valid sampling method that best represents it. Circle your selection.**

*a computer randomly chooses 500 people from a list of members*

Stratified Random Sample	Simple Random Sample	Systematic Random Sample
--------------------------------	----------------------------	--------------------------------

Simple Random Sample

*members are separated by state and 10 people are randomly chosen from each state*

Stratified Random Sample	Simple Random Sample	Systematic Random Sample
--------------------------------	----------------------------	--------------------------------

Stratified Random Sample

*from a list of each member in the association, every 200th is surveyed*

Stratified Random Sample	Simple Random Sample	Systematic Random Sample
--------------------------------	----------------------------	--------------------------------

Systematic Random Sample

### Check

For each sampling description, identify the valid sampling method that best describes it.

*To determine which passengers' carry-on bags are to be inspected, every eighth person to check in will have his or her bag inspected.*

Systematic Random Sample

*To test the accuracy of a biometric scanner, a scientist uses a computer to generate a sample of 20 subjects from a population.*

Simple Random Sample

*The principal of a high school wants to use a survey to decide on the theme for their winter formal dance. She separates the students by grade – 9th, 10th, 11th, and 12th – and then takes a sample of 50 students from each grade.*

Stratified Random Sample



## Practice

1. For each sampling description, identify the valid sampling method that best describes it. Choose from *simple random sample*, *stratified random sample*, or *systematic random sample*. (Example 1)
  - a. To determine if a candidate for state senator is popular with voters, 25% of voters in 160 counties are surveyed.
  - b. To determine whether students think a new school library is needed, a computer generates a list of 100 random students and they are surveyed.
  - c. To determine the freshness of doughnuts, a baker selects a doughnut every 30 minutes and checks it.

### SOLUTION:

- a. Because the population is divided into groups and then a simple random sample is then selected from each group it is a stratified random sample.
  - b. Because each person in the population is as likely to be chosen as any other it is a simple random sample.
  - c. Because the sample is selected from the population according to a specific time interval it is a systematic random sample.
2. Identify the type of biased sample for each situation. Choose from *convenience sample* or *voluntary response sample*. (Example 2)
    - a. A physical education teacher posts an online survey about whether students would be interested in a 5K race. The responses received determine whether there will be a 5K race.
    - b. To determine the theme of the school dance, the student council president surveys his homeroom class.

### SOLUTION:

- a. This sample involves only those who want to, or can, participate in the sampling so it is a voluntary response sample.
- b. This sample includes members of the population that are easily accessed so it is a convenience sample.

**Identify the sample method used and whether it is biased or unbiased.**

**Then determine whether the inference is valid. (Examples 3 and 4)**

3. To evaluate customer satisfaction, a grocery store manager gives double coupons to anyone who completes a survey as they enter the store. The store manager determines that customers are very satisfied with their shopping experience in his store.

**SOLUTION:**

This sample involves only those who want to, or can, participate in the sampling so it is a voluntary response sample. The results are biased because the responses will likely favor opinions that come only from people who feel very strongly about that topic. So, the inference is not valid.

4. A member of the cafeteria staff asks every fifth student leaving the cafeteria to rank 5 entrees from most favorite to least favorite. She finds that pizza is one of the favorite entrees.

**SOLUTION:**

This sample is selected from the population according to a specific number so it is a systematic random sample. The results are unbiased because the sample is unbiased and representative. So, the inference is valid.

5. **Multiselect** To evaluate the defect rate of its lenses, a camera lens manufacturer tests every 100th lens off the production line. Out of 1,000 lenses tested, one lens is found to be defective. The manufacturer concludes that 3 lenses out of 3,000 will be defective. Select all of the statements that are true about the sampling method.

- ☐ This scenario is a systematic random sample.
- ☐ The sampling method is biased.
- ☐ The inference is valid.
- ☐ This scenario is a convenience sample.
- ☐ The sampling method is unbiased.

**SOLUTION:**

This sample is selected from the population according to a specific number, so it is a systematic random sample. The results are unbiased because the sample is unbiased and representative. So, the inference is valid.



12	Make predictions about a population based on data from a random sample	(1-6)	591
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1. A school librarian is purchasing new books for her book clubs in the coming year. In order to determine how many books she needs, she randomly surveys 25 students who plan to participate in one of her book clubs in the coming year. The table shows the results. Predict how many science fiction books she will need to purchase if 125 students participate in book club next year. (Example 1)

Book Club Type	Number of Students
Autobiography	2
Graphic Novel	7
Mystery	10
Science Fiction	6

**SOLUTION:**

$$\frac{6}{25}$$

Write the ratio of students who prefer science fiction books to the total number of students surveyed.

$$\frac{6}{25} = \frac{s}{125}$$

Solve a proportion. Let  $s$  = the number of science fiction books.

$$\frac{6}{25} = \frac{30}{125}$$

Because  $25(5) = 125$ , multiply 6 by 5 to obtain 30.

The school librarian should buy 30 science fiction books.

2. A smart tablet manufacturer tests 1 out of every 25 screens for flaws. Out of 125 tablets tested, 2 had defective screens. How many defective screens should the manufacturer expect out of 45,000 smart tablets? (Example 1)

**SOLUTION:**

$$\frac{2}{125}$$

Write the ratio of defective screens to the total number of tablets tested.

$$\frac{2}{125} = \frac{d}{45,000}$$

Solve a proportion. Let  $d$  = the number of defective screens.

$$\frac{2}{125} = \frac{720}{45,000}$$

Because  $125(360) = 45,000$ , multiply 2 by 360 to obtain 720.

The manufacturer should expect 720 tablets to be defected.

3. The superintendent of a school district wants to predict next year's middle school lunch count. The graph shows the results of a survey of randomly selected middle school students. If the district has 5,000 middle school students next year, about how many students plan to buy lunch 1-2 days a week? (Example 2)

How Many Days Will You Buy Lunch?



**SOLUTION:**

Find 37% of 5,000. Let  $n$  represent the unknown part.

$$\frac{37}{100} = \frac{n}{5,000}$$

Write the proportion.

$$\frac{37}{100} = \frac{1,850}{5,000}$$

Because  $100(50) = 5,000$ , multiply 37 by 50 to obtain 1,850.

So, about 1,850 students.

4. The guidance department conducted a random survey of the student body and found that 16% of the students plan to volunteer at the school festival. Predict how many volunteer positions they should plan for a population of 950 students. (Example 2)

**SOLUTION:**

Find 16% of 950. Let  $n$  represent the unknown part.

$$\frac{16}{100} = \frac{n}{950} \quad \text{Write the proportion.}$$

$$\frac{16}{100} = \frac{152}{950} \quad \text{Because } 100(9.5) = 950, \text{ multiply 16 by 9.5 to obtain 152.}$$

So, about 152 positions.

5. The owner of a travel agency randomly surveyed its customers. The survey showed that 55% of the agency's customers were planning an overseas vacation the following year. Predict how many of the travel agency's 12,400 travelers will vacation overseas the following year. (Example 2)

**SOLUTION:**

Find 55% of 950. Let  $n$  represent the unknown part.

$$\frac{55}{100} = \frac{n}{12,400} \quad \text{Write the proportion.}$$

$$\frac{55}{100} = \frac{6,820}{12,400} \quad \text{Because } 100(124) = 12,400, \text{ multiply 55 by 124 to obtain 6,820.}$$

So, about 6,820 customers.

6. **Open Response** Every 30 minutes, a box of crayons is pulled from the assembly line to check the quality. Of 240 checked boxes of crayons, 2 did not pass inspection. How many boxes out of 12,000 should the crayon company expect to not pass inspection?

**SOLUTION:**

$$\frac{2}{240} \quad \text{Write the ratio of defective boxes to the total number of boxes checked.}$$

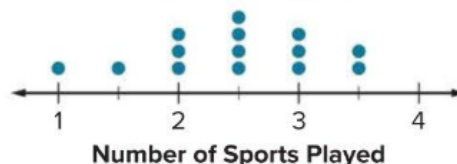
$$\frac{2}{240} = \frac{d}{12,000} \quad \text{Solve a proportion. Let } d = \text{the number of defective boxes.}$$

$$\frac{2}{240} = \frac{100}{12,000} \quad \text{Because } 240(50) = 12,000, \text{ multiply 2 by 50 to obtain 100.}$$

The manufacturer should expect 100 boxes not to pass.

1. The dot plot displays data from 14 random samples, each consisting of 30 middle school students. Each dot represents the mean number of sports played per year by students in the sample. (Example 1)

Means of Samples

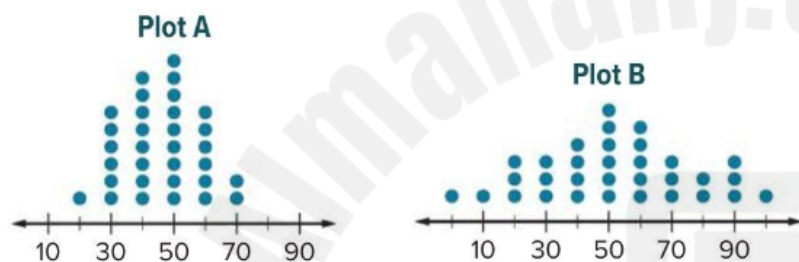


- a. Which number best represents the mean number of sports played by middle school students?

**SOLUTION:**

- a. The sample means pile up between 2 and 3 sports. So, the mean of the population should be close to 2.5 sports.  
 b. 0.54 sports; Sample answer: The majority of the sample means are within 0.5 sport of the mean. This means our estimate is likely not far off from the true mean.

2. **Open Response** Below are two dot plots containing sample means from the same population.



- A. How many samples are represented in each plot? How do you know?

2025

- B. Which dot plot has higher variability? Defend your answer.

2024

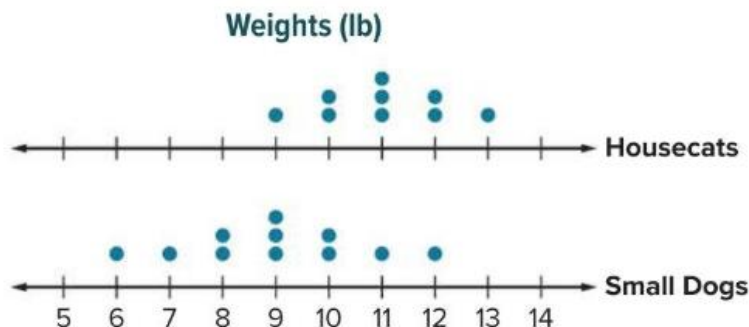
- C. One plot contains samples of size 25, and the other plot contains samples of size 60. Which dot plot contains the samples of size 60? How do you know?

**SOLUTION:**

- a. Count the number dots in each plot. There are 32 dots in each plot. So, there are 32 samples because each dot represents one sample.  
 b. The data are more scattered in Plot B than in Plot A so Plot B has a higher variability.  
 c. There is more variability among means from smaller sample sizes. So, Plot A contains the samples of 60. There is less variability between the means among the samples of 60.

14	Use the measures of center and measures of variation to compare two samples	(1-5)	611,612
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1. The double dot plot shows the weights in pounds of several housecats and small dogs. Compare their centers and variability. What are some appropriate inferences you can make about the data? (Example 1)



**SOLUTION:**

Sample answer: Both dot plots are symmetric. You can use either the mean and mean absolute deviation, or the median and interquartile range. For this problem, use the mean and mean absolute deviation.

Find each mean.

**housecat**

$$\begin{aligned}\text{mean} &= \frac{9 + 2(10) + 3(11) + 2(12) + 13}{9} \\ &= \frac{99}{9} \text{ or } 11\end{aligned}$$

The mean for the housecat data is 11 lb.

**small dog**

$$\begin{aligned}\text{mean} &= \frac{6 + 7 + 2(8) + 3(9) + 2(10) + 11 + 12}{11} \\ &= \frac{99}{11} \text{ or } 9\end{aligned}$$

The mean for the small dog data is 9 lb.

Find each mean absolute deviation (MAD).

**housecat**

$$\begin{aligned}\text{MAD} &= \frac{2 + 2(1) + 3(0) + 2(1) + 2}{9} \\ &\text{from the mean.} \\ &= \frac{8}{9} \text{ or } 0.9\end{aligned}$$

The MAD for the housecat data is 0.9 lb.

**small dog**

$$\begin{aligned}\text{MAD} &= \frac{3 + 2 + 2(1) + 3(0) + 2(1) + 2 + 3}{11} \\ &\text{from the mean.} \\ &= \frac{14}{11} \text{ or } 1.3\end{aligned}$$

The MAD for the small dog data is 1.3 lb.

The mean for the housecat data is 11 pounds with a variation of about 0.9 pound. The mean for the small dog data is 9 pounds with a variation of 1.3 pounds.

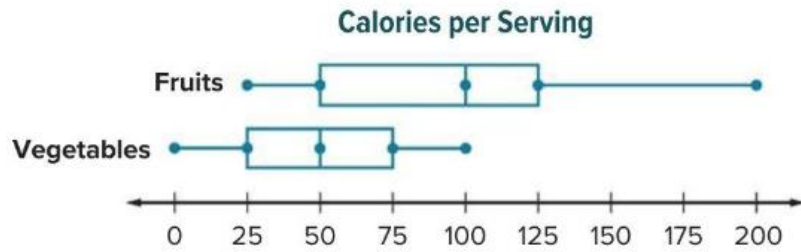
Compare the data.

$$11 > 9 \quad 0.9 < 1.3$$

Overall, the housecats weigh more with less variation. You can infer that a randomly selected housecat is likely to weigh more than a randomly selected dog.



2. The double box plot shows the number of Calories per serving for various fruits and vegetables. What are some appropriate inferences you can make about the data? (Example 1)



**SOLUTION:**

Sample answer: Compare the measures of center and variation.

Find each median.

**Fruits**

The median is 100 Calories.

**Vegetables**

The median is 50 Calories.

The median for the fruit data is 100 Calories with a variation of 75 Calories. The median for the vegetable data is 50 Calories with a variation of 50 Calories.

Find each interquartile range (IQR).

**Fruits**

$$\begin{aligned} \text{IQR} &= 125 - 50 \\ &= 75 \end{aligned}$$

$$\begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &\text{Subtract.} \end{aligned}$$

Compare the data.

$$100 > 50 \quad 75 > 50$$

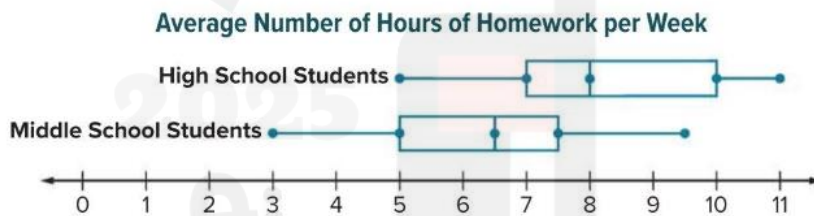
Overall, the fruits have a higher number of Calories with a greater variation. You can infer that a randomly selected fruit is likely to have more Calories than a randomly selected vegetable.

**Vegetables**

$$\begin{aligned} \text{IQR} &= 75 - 25 \\ &= 50 \end{aligned}$$

$$\begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &\text{Subtract.} \end{aligned}$$

3. **Table Item** The double box plot represents the average number of hours of homework each week for high school students and middle school students. Use the measures of center and variability of these samples to select the age group(s) to which each statement applies.



	Middle School	High School
The median is greater.		★
The IQR is 2.5.	★	
The data have greater variability.		★
A person from this sample is more likely to have more than 7 hours of homework a week.		★
The data are more symmetric.	★	

**SOLUTION:**

Find each median.

**High School Students**

The median is 8 hours.

**Middle School Students**

The median is 6.5 hours.

Find each interquartile range (IQR).

**High School Students**

$$\begin{aligned} \text{IQR} &= 10 - 7 \\ &= 3 \end{aligned} \quad \begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &\text{Subtract.} \end{aligned}$$

**Middle School Students**

$$\begin{aligned} \text{IQR} &= 7.5 - 5 \\ &= 2.5 \end{aligned} \quad \begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &\text{Subtract.} \end{aligned}$$

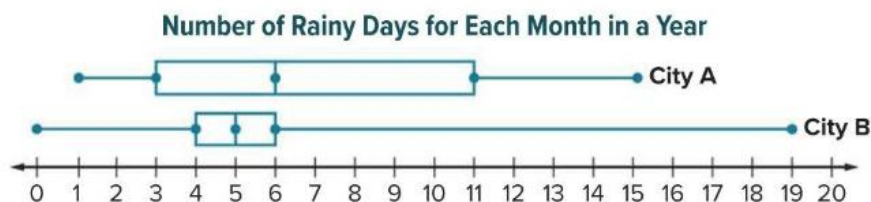
The IQR is 2.5 for the middle school data.

Because  $8 > 6.5$  the high school data have a greater median.

Because  $3 > 2.5$  the high school data have a greater variation. A person from this sample is more likely to have more than 7 hours of homework a week would come from the high school sample. The data is more symmetric for the middle school data.

### Apply

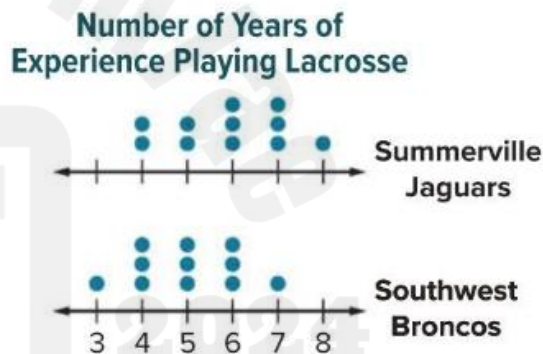
4. The double box plot shows the number of rainy days for each month in a year for two different cities. For which city is it more likely that a randomly selected month will have 6 or more rainy days?



### SOLUTION:

The median number of rainy days for City A is 6 days and the median number of rainy days for City B is 5 days. Because  $6 > 5$  City A is more likely to have 6 or more rainy days.

5. The double dot plot shows the number of years of experience playing lacrosse for members of two high school lacrosse teams. A player with six years of experience is on a lacrosse team. On which team is the player more likely to be? Write an argument that can be used to defend your solution.

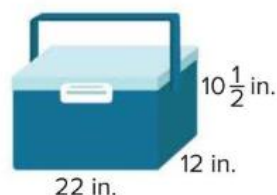


### SOLUTION:

The median number of years of experience for Southwest Broncos is 5 years while the median number of years of experience for Summerville Jaguars is 6 years. It is more likely that the player belongs to the Jaguars.

1. A cooler is in the shape of a rectangular prism. What is the volume of the cooler? Round to the nearest tenth if necessary.

(Example 1)



**SOLUTION:**

$$V = Bh$$

$$V = (\ell w)h$$

$$V = (22 \cdot 12)10\frac{1}{2}$$

$$V = 2,772$$

2. A cereal box is in the shape of a rectangular prism. What is the volume of the cereal box? Express your answer as a decimal rounded to the nearest tenth if necessary. (Example 1)



**SOLUTION:**

$$V = Bh$$

$$V = (\ell w)h$$

$$V = (8 \cdot 1\frac{3}{4})12\frac{1}{8}$$

$$V = 169.8$$

7. A triangular prism has a height of 5.9 meters and volume of 86.376 cubic meters. What is the area of the base of the prism? (Example 4)

**SOLUTION:**

$$V = Bh$$

$$86.376 = B(5.9)$$

$$86.376 = 5.9B$$

$$\frac{86.376}{5.9} = \frac{5.9B}{5.9}$$

$$14.64 = B$$

8. A rectangular pyramid has a height of 9.5 centimeters and a volume of 494 cubic centimeters. What is the area of the base of the pyramid? (Example 5)

**SOLUTION:**

$$V = \frac{1}{3}Bh$$

$$494 = \frac{1}{3}B(9.5)$$

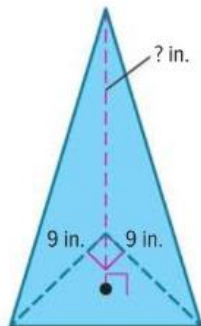
$$494 = 3\frac{1}{6}B$$

$$\frac{494}{3\frac{1}{6}} = \frac{3\frac{1}{6}B}{3\frac{1}{6}}$$

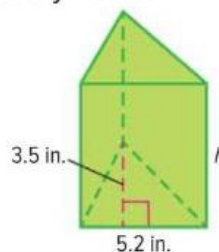
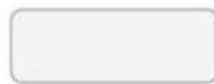
$$156 = B$$



9. A glass stand to display a doll is in the shape of a right triangular pyramid as shown. The volume of the stand is 202.5 cubic inches. What is the height of the stand? (Example 5)



10. **Open Response** A triangular box of sticky notes is shown. The volume of the box of sticky notes is 54.6 cubic inches. What is the height of the box of sticky notes?



**SOLUTION:**

$$\begin{aligned}
 V &= \frac{1}{3} Bh \\
 V &= \frac{1}{3} \left( \frac{1}{2} \cdot 9 \cdot 9 \right) h \\
 V &= \frac{1}{3} (40.5) h \\
 202.5 &= \frac{1}{3} (40.5) h \\
 \frac{202.5}{13.5} &= \frac{13.5h}{13.5} \\
 15 &= h
 \end{aligned}$$

**SOLUTION:**

$$\begin{aligned}
 V &= Bh \\
 V &= \left( \frac{1}{2} \cdot 5.2 \cdot 3.5 \right) h \\
 V &= (9.1) h \\
 54.6 &= (9.1) h \\
 \frac{54.6}{9.1} &= \frac{9.1h}{9.1} \\
 6 &= h
 \end{aligned}$$

## Part 2: Free Response Questions (FRQ): Questions 16-21

16	Find the areas of circles given the radius or diameter using the formula for the area of a circle	EX4(7-8)	462,465
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### Example 4 Use Circumference to Find Area

The exact circumference of a circle is  $32\pi$  inches.

**What is the approximate area of the circle? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary.**

**Step 1** Use the circumference formula to find the radius of the circle.

$$C = 2\pi r$$

Circumference of a circle

$$32 = 2\pi r$$

Replace  $C$  with  $32\pi$ .

$$\frac{32\pi}{2\pi} = \frac{2\pi r}{2\pi}$$

Division Property of Equality; Divide each side by  $2\pi$ .

$$16 = r$$

Simplify.

The radius of the circle is 16 inches.

**Step 2** Find the area.

$$A = \pi r^2$$

Area of a circle

$$A \approx 3.14 \cdot 16^2$$

Replace  $\pi$  with 3.14 and  $r$  with 16.

$$A \approx 803.84$$

Simplify.

So, the approximate area of the circle is 803.84 square inches.

## Check

The exact circumference of a circle is  $13\pi$  feet. What is the approximate area of the circle? Use 3.14 for  $\pi$ . Round to the nearest hundredth.

$$C = 2\pi r$$

$$r = \frac{C}{2\pi}$$

$$r = \frac{13\pi}{2\pi}$$

$$r = 6.5$$

$$A = \pi r^2$$

$$A = \pi \times 6.5^2$$

$$A = 3.14 \times 6.5 \times 6.5$$

7. The exact circumference of a circle is  $18\pi$  inches. What is the approximate area of the circle? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary. (Example 4)

**SOLUTION:**

$$r = \frac{C}{2\pi}$$

$$r \approx \frac{34.48}{2(3.14)}$$

$$r \approx 5.49$$

### Test Practice

8. **Open Response** The exact circumference of a circle is  $34\pi$  meters. What is the approximate area of the circle? Use 3.14 for  $\pi$ . Round to the nearest hundredth if necessary.

**SOLUTION:**

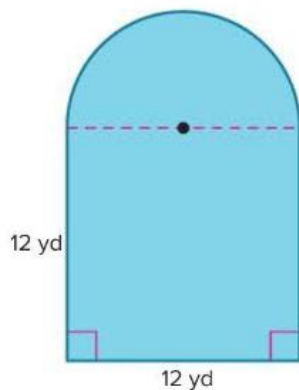
$$r = \frac{C}{2\pi}$$

$$r \approx \frac{198}{2(3.14)}$$

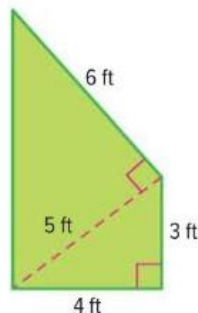
$$r \approx 31.53$$

Find the area of each figure. If necessary, use 3.14 for  $\pi$  and round to the nearest hundredth. (Example 1)

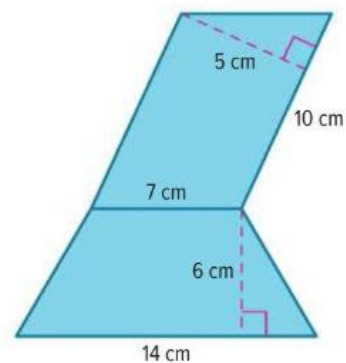
1.



2.



3.

**Rectangle**

$$\begin{aligned} A &= \ell w \\ &= 12 \cdot 12 \\ &= 144 \end{aligned}$$

**Semicircle**

$$\begin{aligned} A &= \frac{1}{2} \pi r^2 \\ &= \frac{1}{2} \cdot 3.14 \cdot 6^2 \\ &= 56.25 \end{aligned}$$

Find the area of the composite figure.  
 $144 + 56.25 = 200.52$

**Triangle 1**

$$\begin{aligned} A &= \frac{1}{2} bh \\ &= \frac{1}{2} \cdot 5 \cdot 6 \\ &= 15 \end{aligned}$$

**Triangle 2**

$$\begin{aligned} A &= \frac{1}{2} bh \\ &= \frac{1}{2} \cdot 4 \cdot 3 \\ &= 6 \end{aligned}$$

Find the area of the composite figure.  
 $15 + 6 = 21$

**Parallelogram**

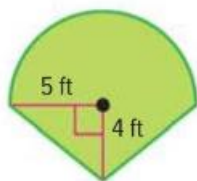
$$\begin{aligned} A &= bh \\ &= 10 \cdot 5 \\ &= 50 \end{aligned}$$

**Trapezoid**

$$\begin{aligned} A &= \frac{1}{2} h(b_1 + b_2) \\ &= \frac{1}{2} \cdot 6(7 + 14) \\ &= \frac{1}{2} \cdot 6(21) \\ &= 63 \end{aligned}$$

Find the area of the composite figure.  
 $50 + 63 = 113$

4.



Triangle

$$A = \frac{1}{2}bh$$

$$= \frac{1}{2} \cdot 4 \cdot 10$$

$$= 20$$

Semicircle

$$A = \frac{1}{2}\pi r^2$$

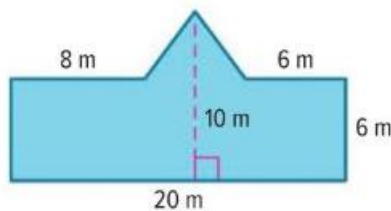
$$= \frac{1}{2} \cdot 3.14 \cdot 5^2$$

$$= 39.25$$

Find the area of the composite figure.

$$20 + 39.25 = 59.25$$

5.



Triangle

$$A = \frac{1}{2}bh$$

$$= \frac{1}{2} \cdot 6 \cdot 10$$

$$= 30$$

Rectangle

$$A = \ell w$$

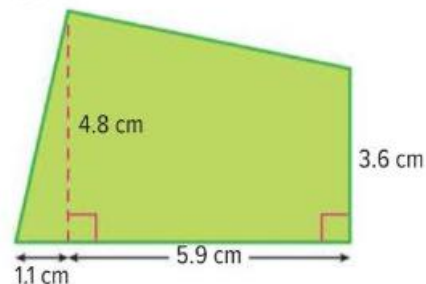
$$= 6 \cdot 20$$

$$= 120$$

Find the area of the composite figure.

$$30 + 120 = 150$$

6.



Triangle

$$A = \frac{1}{2}bh$$

$$= \frac{1}{2} \cdot 1.1 \cdot 4.8$$

$$= 2.64$$

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$= \frac{1}{2} \cdot 5.9(4.8 + 3.6)$$

$$= \frac{1}{2} \cdot 5.9(8.4)$$

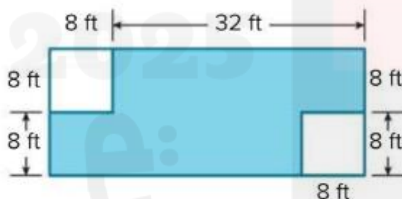
$$= 24.70$$

Find the area of the composite figure.

$$2.64 + 24.70 = 27.34$$

7. Find the area of the shaded region.

(Example 2)



Find the area of the entire figure.

$$A = \ell w$$

$$= (40)(16)$$

$$= 640$$

Area of entire figure, a rectangle

Replace  $\ell$  with 40 and  $w$  with 16.

Simplify.

Find the two unshaded areas. The unshaded area is two squares with same the side length.

$$A = s^2$$

$$= 8^2$$

$$= 64$$

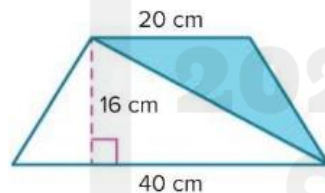
Area of unshaded region, a square

Replace  $s$  with 8.

Simplify.

The area of unshaded areas is  $64 + 64$  or 128.The area of the shaded region is  $640 - 128$  or 512 square feet.

8. Open Response Find the area of the shaded region.



SOLUTION:

Find the area of the entire figure.

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$= \frac{1}{2}(16)(20 + 40)$$

$$= \frac{1}{2}(16)(60)$$

$$= 480$$

Find unshaded area.

$$A = \frac{1}{2}bh$$

$$= \frac{1}{2} \cdot 40 \cdot 16$$

$$= 320$$

Area of entire figure, a trapezoid

Replace  $h$  with 16,  $b_1$  with 20, and  $b_2$  with 40.

Add.

Simplify.

Area of unshaded region, a triangle

Replace  $b$  with 40 and  $h$  with 16.

Simplify.

The area of the shaded region is  $480 - 320$  or 160 square centimeters.

1. An Italian ice shop sells Italian ice in four flavors: lime, cherry, blueberry, and watermelon. The ice can be served plain, mixed with ice cream, or as a drink. Using an organized list or table, what is the sample space of possible outcomes? (Example 1)

**SOLUTION:**

Use an organized list. List each flavor with each way it can be served.

Sample space: lime plain, lime ice cream, lime drink, cherry plain, cherry ice cream, cherry drink, blueberry plain, blueberry ice cream, blueberry drink, watermelon plain, watermelon ice cream, watermelon drink

2. A deli offers a lunch consisting of a soup, salad, and sandwich from the menu shown in the table. A customer randomly chooses lunch consisting of a soup, salad, and sandwich. Construct and use a tree diagram to determine the sample space of the event. How many possible outcomes are in the sample space? (Example 2)

Soup	Salad	Sandwich
Tortellini	Caesar	Roast Beef
Lentil	Macaroni	Ham
		Turkey

**SOLUTION:**

Construct a tree diagram. List each soup with each salad, and each sandwich.

**Sample answer:**

There are 12 outcomes.

## Example 2 Surface Area of Triangular Prisms

How much paper is needed to cover the gift box shown?

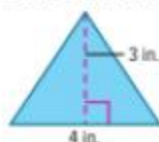
**Step 1** Find the area of the bases and faces.

In any triangular prism, the bases are congruent, but the faces are not always congruent.

In this triangular prism, there are two congruent triangular bases. There are three rectangular faces, two of which are congruent.



Area of the Bases



$$\begin{aligned} \text{Area} &= 2\left(\frac{1}{2} \cdot 4 \cdot 3\right) \\ &= 2(6) \\ &= 12 \end{aligned}$$

There are 2 triangular bases, each with an area of  $\frac{1}{2} \cdot 4 \cdot 3$ .

Multiply.

Simplify.

Area of Face 1



$$\begin{aligned} A &= 3.6 \cdot 14 \\ &= 50.4 \end{aligned}$$

Area of Face 2



$$\begin{aligned} A &= 3.6 \cdot 14 \\ &= 50.4 \end{aligned}$$

Area of Face 3



$$\begin{aligned} A &= 4 \cdot 14 \\ &= 56 \end{aligned}$$

The areas of the rectangular faces are 50.4 square inches, 50.4 square inches, and 56 square inches.

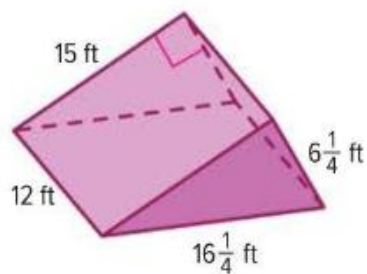
**Step 2** Find the sum of the areas of the faces.

So,  $12 + 50.4 + 50.4 + 56$ , or **168.8** square inches of paper is needed to cover the gift box.



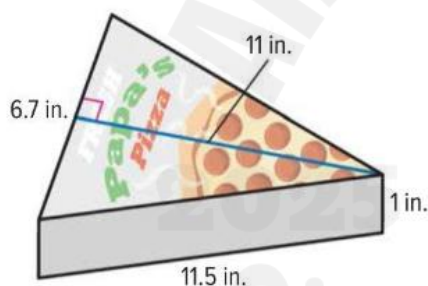
## Check

Find the surface area of the prism.



$$543\frac{3}{4} \text{ ft}^2$$

3. How much cardboard is needed to make the single slice of pizza box shown? (Example 2)



**Area Bases:**

$$A = 2\left(\frac{1}{2} \cdot 6.7 \cdot 11\right)$$

$$= 2(36.85)$$

$$= 73.7$$

The combined area of the two triangular bases is 73.7 square inches.

There are three rectangular faces, two of which are congruent.

**Area of Face 1**

$$A = 6.7 \cdot 1$$

$$= 6.7 \text{ in}^2$$

**Area of Face 2**

$$A = 11.5 \cdot 1$$

$$= 11.5 \text{ in}^2$$

**Area of Face 3**

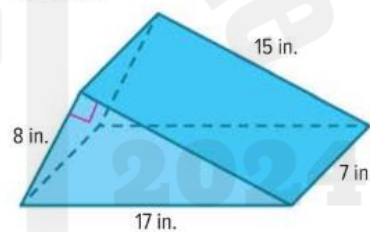
$$A = 11.5 \cdot 1$$

$$= 11.5 \text{ in}^2$$

Find the sum of the areas of the faces.

So,  $73.7 + 6.7 + 11.5 + 11.5$  or 103.4 square inches of cardboard.

4. **Open Response** What is the surface area of the triangular prism-shaped toy car ramp shown?



**Area Bases:**

$$A = 2\left(\frac{1}{2} \cdot 8 \cdot 15\right)$$

$$= 2(60)$$

$$= 120$$

The combined area of the two triangular bases is 120 square inches.

There are three rectangular faces.

**Area of Face 1**

$$A = 8 \cdot 7$$

$$= 56 \text{ in}^2$$

**Area of Face 2**

$$A = 17 \cdot 7$$

$$= 119 \text{ in}^2$$

**Area of Face 3**

$$A = 15 \cdot 7$$

$$= 105 \text{ in}^2$$

Find the sum of the areas of the faces.

So,  $120 + 56 + 119 + 105$  or 400 square inches of cardboard.

5. The table shows the lengths of time for rides at a fair. Zane will choose a ride at random and wants to find the probability of choosing a ride that lasts less than 200 seconds. What is the probability of the complement of the event? Describe the complement. (Example 3)

Ride	Time (seconds)
Barrel	150
Bumper Cars	195
Circus Carousel	210
Log Ride	120
Roller Coaster	55
Swings	225
Train	300
Zero Gravity Spinner	65

**SOLUTION:**

Find the probability of the complement.

$$P(\text{not lasts less than 200 seconds}) = \frac{3}{8}$$

There are 3 outcomes in the complement. There are 8 total

outcomes.

So, the probability of the complement is  $\frac{3}{8}$ , 0.37, or 37.5%. The complement is choosing a ride that lasts at least 200 seconds.

6. Red is spun on a spinner with five equal-size sections labeled red, yellow, blue, green, and purple. What is the probability of the complement of the event? Describe the complement. (Example 3)

**SOLUTION:**

Find the probability of the complement.

$$P(\text{not red}) = \frac{4}{5}$$

There are 4 outcomes in the complement. There are 5 total outcomes.

So, the probability of the complement is  $\frac{4}{5}$ , 0.8, or 80%. The complement is spinning yellow, blue, green, or purple.

### Test Practice

7. **Multiselect** A sportscaster predicted that the local high school baseball team has a 75% chance of winning tonight. Select all of the values that represent the probability of the team *not* winning.

☐ 0.75

☐ 25%

☐ 0.25

☐  $\frac{3}{4}$ 
☐ 75%

☐  $\frac{1}{4}$ 

**SOLUTION:**

$$P(\text{winning}) + P(\text{not winning}) = 1$$

$$75\% + P(\text{not winning}) = 100\%$$

$$P(\text{not winning}) = 25\%$$

Complementary events equation

Replace  $P(\text{winning})$  with 75%.

Subtract 75% from each side.

25% is equivalent to 0.25 and  $\frac{1}{4}$ . So, select 25%, 0.25, and  $\frac{1}{4}$ .

### Example 1 Make Predictions

A high school athletic director is purchasing equipment for the athletic department in the coming year. In order to determine how much equipment is needed, the director randomly surveys 150 students who plan to participate in athletics in the coming year. The table shows the results.

Sport	Students
Baseball/Softball	36
Basketball	30
Football	45
Gymnastics	12
Tennis	18
Volleyball	9

**How many volleyball uniforms should the director purchase if 500 total students plan to participate in athletics?**

**Step 1** Write the ratio of students who plan to play volleyball to the total number of students surveyed.

$$\frac{\text{volleyball players}}{\text{total students surveyed}} \rightarrow \frac{9}{150}$$

**Step 2** Set up and solve a proportion. Let  $v$  represent the number of volleyball uniforms the director should order.

$$\frac{\text{volleyball players}}{\text{students surveyed}} \rightarrow \frac{9}{150} = \frac{v}{500} \quad \begin{array}{l} \leftarrow \text{volleyball uniforms} \\ \leftarrow \text{total number of students} \end{array}$$

$$\frac{3}{50} = \frac{v}{500}$$

Write  $\frac{9}{150}$  as the equivalent ratio  $\frac{3}{50}$ .

$$\frac{3}{50} = \frac{30}{500}$$

Because  $50(10) = 500$ , multiply 3 by 10 to obtain 30.

So, the director should purchase 30 volleyball uniforms.

### Check

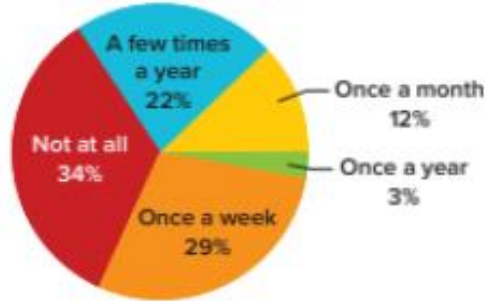
A local dentist wants to know how many adults in a town receive regular cleanings. The dentist surveys 120 random adults living in the town and finds 84 people receive regular cleanings. If there are 8,500 adults in the town, how many can be expected to receive regular cleanings?

**5,950 adults**

## Example 2 Make Predictions

The superintendent of a school district wants to determine the number of volunteer positions to have available for students. The graph shows the results of a survey where randomly selected teenagers within the district were asked, "How often do you volunteer?"

How Often Teens Volunteer



If the district has 2,000 teenage students, about how many positions should the superintendent have available for students who volunteer once a week?

While you do not know the number of teens in the sample, the circle graph shows the percent of teens who volunteer. This percent is the ratio that can be used for the sample. The graph shows that 29% of students volunteer once a week.

Find 29% of 2,000. Let  $n$  represent the unknown part.

$$\frac{29}{100} = \frac{n}{2,000} \quad \text{Write the proportion.}$$

$$\frac{29}{100} = \frac{n}{2,000} \quad \text{Find an equivalent ratio.}$$

*(Note: The diagram shows arrows indicating that both the numerator and denominator of the right-hand fraction are multiplied by 20 to get the equivalent fraction  $\frac{580}{1000}$ .)*

So, the superintendent should have about 29(20), or 580 volunteer positions available for students who volunteer once a week.

## Check

The manager of a movie theater wants to better predict how much popcorn to prepare each day. Every 15th customer was surveyed as to whether or not they buy popcorn and 63% said they buy popcorn. If the theater expects to have 3,200 customers during a weekend, how many people are expected to buy popcorn?

2,016 people



1. A school librarian is purchasing new books for her book clubs in the coming year. In order to determine how many books she needs, she randomly surveys 25 students who plan to participate in one of her book clubs in the coming year. The table shows the results. Predict how many science fiction books she will need to purchase if 125 students participate in book club next year. (Example 1)

Book Club Type	Number of Students
Autobiography	2
Graphic Novel	7
Mystery	10
Science Fiction	6

**SOLUTION:**

$$\frac{6}{25}$$

Write the ratio of students who prefer science fiction books to the total number of students surveyed.

$$\frac{6}{25} = \frac{s}{125}$$

Solve a proportion. Let  $s$  = the number of science fiction books.

$$\frac{6}{25} = \frac{30}{125}$$

Because  $25(5) = 125$ , multiply 6 by 5 to obtain 30.

The school librarian should buy 30 science fiction books.

2. A smart tablet manufacturer tests 1 out of every 25 screens for flaws. Out of 125 tablets tested, 2 had defective screens. How many defective screens should the manufacturer expect out of 45,000 smart tablets? (Example 1)

**SOLUTION:**

$$\frac{2}{125}$$

Write the ratio of defective screens to the total number of tablets tested.

$$\frac{2}{125} = \frac{d}{45,000}$$

Solve a proportion. Let  $d$  = the number of defective screens.

$$\frac{2}{125} = \frac{720}{45,000}$$

Because  $125(360) = 45,000$ , multiply 2 by 360 to obtain 720.

The manufacturer should expect 720 tablets to be defected.

3. The superintendent of a school district wants to predict next year's middle school lunch count. The graph shows the results of a survey of randomly selected middle school students. If the district has 5,000 middle school students next year, about how many students plan to buy lunch 1-2 days a week? (Example 2)

How Many Days Will You Buy Lunch?



**SOLUTION:**

Find 37% of 5,000. Let  $n$  represent the unknown part.

$$\frac{37}{100} = \frac{n}{5,000}$$

Write the proportion.

$$\frac{37}{100} = \frac{1,850}{5,000}$$

Because  $100(50) = 5,000$ , multiply 37 by 50 to obtain 1,850.

So, about 1,850 students.



4. The guidance department conducted a random survey of the student body and found that 16% of the students plan to volunteer at the school festival. Predict how many volunteer positions they should plan for a population of 950 students. (Example 2)

**SOLUTION:**

Find 16% of 950. Let  $n$  represent the unknown part.

$$\frac{16}{100} = \frac{n}{950} \quad \text{Write the proportion.}$$

$$\frac{16}{100} = \frac{152}{950} \quad \text{Because } 100(9.5) = 950, \text{ multiply 16 by 9.5 to obtain 152.}$$

So, about 152 positions.

5. The owner of a travel agency randomly surveyed its customers. The survey showed that 55% of the agency's customers were planning an overseas vacation the following year. Predict how many of the travel agency's 12,400 travelers will vacation overseas the following year. (Example 2)

**SOLUTION:**

Find 55% of 950. Let  $n$  represent the unknown part.

$$\frac{55}{100} = \frac{n}{12,400} \quad \text{Write the proportion.}$$

$$\frac{55}{100} = \frac{6,820}{12,400} \quad \text{Because } 100(124) = 12,400, \text{ multiply 55 by 124 to obtain 6,820.}$$

So, about 6,820 customers.