Essential Math

Course modules, practice problems with instant feedback, and video examples in one spot.

REFERENCE

Essential Math Formulas and Conversions

Quick reference for conversions, geometry, interest, and common percent formulas.

US Units and Abbreviations

Length

- 12 in = 1 ft
- 3 ft = 1 yd
- 36 in = 1 yd
- 5280 ft = 1 mi

in = inch, ft = foot, yd = yard, mi = mile

Weight

- 16 oz = 1 lb
- 2000 lb = 1 T

oz = ounce, lb = pound, T = ton

Capacity

- 8 fl oz = 1 c
- 2 c = 1 pt
- 2 pt = 1 qt
- 4 qt = 1 gal

fl oz = fluid ounce, c = cup, pt = pint, qt = quart, gal = gallon

Metric Place Value

Kilo King	Hecto Henry	Deca Died	Base Unit By	Deci Drinking	Centi Chocolate	Milli Milk
k	h	da		d	c	m
km	hm	dam	m meters	dm	cm	mm
kL	hL	daL	L liters	dL	cL	mL
kg	hg	dag	g grams	dg	cg	mg

Metric to US Conversions

Length

- 1 m ≈ 1.09 yd
- 1 m ≈ 3.28 ft
- 1 km ≈ 0.62 mi
- 2.54 cm = 1 in
- 0.30 m ≈ 1 ft
- 1.61 km ≈ 1 mi

Weight (Mass)

- 1 kg ≈ 2.2 lb
- 1 g ≈ 0.04 oz
- 0.45 kg ≈ 1 lb
- 28.35 g ≈ 1 oz

Capacity

- 1 L ≈ 1.06 qt
- 1 L ≈ 0.26 gal
- 3.79 L ≈ 1 gal
- 0.95 L ≈ 1 qt
- 29.57 mL ≈ 1 fl oz

Temperature

Celsius to Fahrenheit

$$F = \frac{9}{5}C + 32$$

$$F = 1.8C + 32$$

Fahrenheit to Celsius

$$C = \frac{5}{9}(F - 32)$$

$$C = \frac{F - 32}{1.8}$$

Perimeter, Area, and Right Triangles

Perimeter

Rectangle	$P = 2l + 2w$
Square	$P = 4s$
Circle circumference	$C = 2\pi r = \pi d$

Area

Rectangle	$A = lw$
Square	$A = s^2$
Circle	$A = \pi r^2$
Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

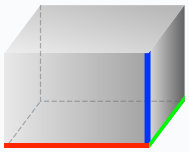
Surface Area and Volume

Rectangular Solid

$$V = lwh$$

$$SA = 2lh + 2wh + 2lw$$

l = length, **w** = width, **h** = height

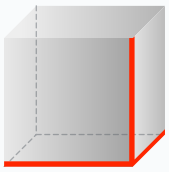


Cube

$$V = s^3$$

$$SA = 6s^2$$

s = side

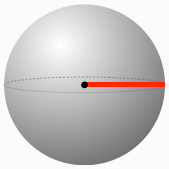


Sphere

$$V = \frac{4}{3}\pi r^3$$

$$SA = 4\pi r^2$$

r = radius

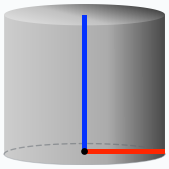


Cylinder

$$V = \pi r^2 h$$

$$SA = 2\pi rh + 2\pi r^2$$

r = radius, **h** = height



Cone

$$V = \frac{1}{3}\pi r^2 h$$

$$SA = \pi r\sqrt{r^2 + h^2} + \pi r^2$$

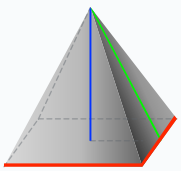
r = radius, **h** = height

Square Pyramid

$$V = \frac{1}{3}s^2 h$$

$$SA = B + \frac{1}{2}pl$$

s = side, **h** = height, **l** = slant height, B = area of base, p = perimeter of base



Interest, Money, and Percent Change

Simple Interest

$$I = Prt$$

- I = amount of interest
- P = principal
- r = annual interest rate
- t = time in years

Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

- A = amount in account
- P = principal
- r = annual interest rate
- n = number of compounding periods per year
- t = time in years

Other Money Formulas

- sales tax = tax rate × purchase price
- total price = purchase price + sales tax
- commission = commission rate × sales
- discount amount = discount rate × original price
- sale price = original price − discount amount

Percent Change

$$\text{percent change} = \frac{\text{amount of change}}{\text{original amount}}$$

Module 1: Algebra and Number Sense

Module 1 builds algebra and number sense through simplifying expressions, solving equations, working with fractions and decimals, and finishing with mean, median, mode, and range.

Module 1A Simplifying Expressions

This topic is about cleaning up expressions by grouping matching terms and combining them into something simpler.

IN PLAIN TERMS

Simplifying means rewriting an expression so it says the same thing in a cleaner way.

KEY PARTS

- Like terms must have the same variable part.
- Constants combine with constants.
- Some expressions need distribution before they can be cleaned up.

RULES AND FORMULAS

- Distribute first when parentheses are involved.
- Watch your signs.
- If terms do not match, they cannot be combined.

LOOK FOR: like terms, negative signs, and whether you need to distribute before combining anything.

VIDEO EXAMPLE

Simplify $7x - x$.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/0kApFQbS-9I?si=-Km4pYX-wey63M12

Answer: $6x$

VIDEO EXAMPLE

Simplify $10x + 36 - 38x - 47$.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/0kApFQbS-9I?si=4h24DkqMQqUq4yVA&t=54

Answer: $-28x - 11$

1. Simplify: $8x + 7x$

Answer: $15x$

2. Simplify: $13b - 5b$

Answer: $8b$

3. Simplify: $10y - 2y - 3y$

Answer: $5y$

4. Simplify: $15x - 6x - x$

Answer: $8x$

5. Simplify: $9m - 4m + 2$

Answer: $5m + 2$

6. Simplify: $12p - p - 5p + 4$

Answer: $6p + 4$

7. Simplify: $11a - 4a + 2a - 6$

Answer: $9a - 6$

8. Simplify: $6x + 9 - 2x - 3$

Answer: $4x + 6$

9. Simplify: $14n - 8 + 3n + 5$

Answer: $17n - 3$

10. Simplify: $7a + 2b - 3a + 5b$

Answer: $4a + 7b$

11. Simplify: $4c - d + 9c + 3d - 1$

Answer: $13c + 2d - 1$

12. Simplify: $5x + 4y - 2x + y + 7$

Answer: $3x + 5y + 7$

Module 1B Simplifying Expressions and Geometry Mix

This set mixes expression work with perimeter and area, so you bounce between algebra and basic geometry.

IN PLAIN TERMS

This topic switches back and forth between algebra expressions and simple geometry formulas.

KEY PARTS

- This topic mixes expression work with perimeter and area.
- Perimeter means add every outside side length.
- Area of a rectangle comes from multiplying length and width.

RULES AND FORMULAS

- Distribute before combining like terms.
- Keep units on every geometry answer.
- Read carefully to tell whether the problem wants perimeter or area.

LOOK FOR: whether you should simplify an expression, add side lengths, or multiply dimensions.

VIDEO EXAMPLE

Simplify $3(2y-1)-5(4y+3)$

SCAN FOR VIDEO WALKTHROUGH

youtu.be/yU1vS11rTgk?si=jpXT815UaWUqrvC8&t=810

Answer: $-14y-18$

VIDEO EXAMPLE

Simplify $-7(k-8)+2k$

SCAN FOR VIDEO WALKTHROUGH

youtu.be/0kApFQbS-9I?si=CNv8WMoVVkF2y5b0&t=137

Answer: $-5k+56$

VIDEO EXAMPLE

Simplify $5+2(3a-5)$

SCAN FOR VIDEO WALKTHROUGH

youtu.be/0kApFQbS-9I?si=90nz7BhEvQnopSdM&t=203

Answer: $6a-5$

1. Simplify: $5(x+2)+7$

Answer: $5x+17$

2. Simplify: $3(4-x)+2$

Answer: $14-3x$

3. Simplify: $7(3z + 2) - 5$

Answer: $21z + 9$

4. Simplify: $-3(2y + 5) - 4$

Answer: $-6y - 19$

5. Simplify: $6x + 3(x + 4)$

Answer: $9x + 12$

6. Simplify: $-4(x + 2) + 9x$

Answer: $5x - 8$

7. Simplify: $8x + 5(x + 3) - 1$

Answer: $13x + 14$

8. Simplify: $9x - 3(4 - x) + 18$

Answer: $12x + 6$

9. Simplify: $2(5x + 4) + 3(x + 1)$

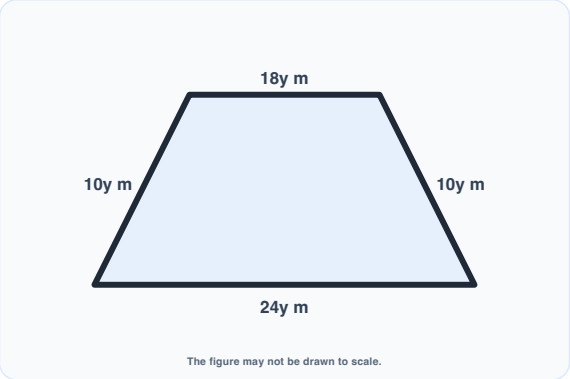
Answer: $13x + 11$

10. Simplify: $4(3x - 2) - 5(x - 4)$

Answer: $7x + 12$

11. Find the perimeter of the trapezoid.

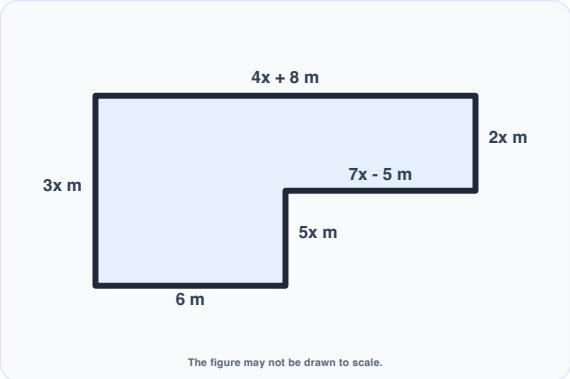
A trapezoid is shown with bases labeled 18y meters and 24y meters and two matching nonparallel sides labeled 10y meters.



Answer: $62y$ meters

12. Find the perimeter of the L-shaped figure.

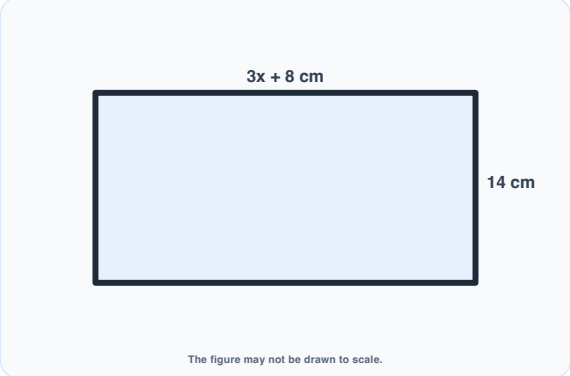
An L-shaped polygon is shown with six outside sides labeled 4x plus 8 meters, 2x meters, 7x minus 5 meters, 5x meters, 6 meters, and 3x meters.



Answer: $21x + 9$ meters

13. Find the area of the rectangle.

A rectangle is shown with one side labeled 3x plus 8 centimeters and the adjacent side labeled 14 centimeters.



Answer: $42x + 112$ square centimeters

Module 1C Solving Equations Part 1

These problems are about getting the variable by itself and keeping both sides balanced as you go.

IN PLAIN TERMS

Solving an equation means finding the number that keeps the equation balanced.

KEY PARTS

- An equation asks for the value that makes both sides equal.
- Some equations need like terms combined before solving.
- Not every equation has one answer.

RULES AND FORMULAS

- Do the same operation to both sides.
- Distribute and simplify before isolating the variable when needed.
- A false statement means no solution.

LOOK FOR: simplify first, isolate the variable, and notice whether the result is one answer or no solution.

VIDEO EXAMPLE

Solve $2x + 1 = 7$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/yU1vS11rTgk?si=1hUHKGF87NpsaSJp&t=941

Answer: $x = 3$

VIDEO EXAMPLE

Solve $5 - 2(3x - 4) = 3 - x$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/yU1vS11rTgk?si=7W3KckkIEmxepDbq&t=989

Answer: $x = 2$

VIDEO EXAMPLE

Solve $2(x + 1) - (x - 8) = x$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/yU1vS11rTgk?si=uPuKaJ8gaKrp-i7f&t=1153

Answer: No solution, because this leads to $10 = 0$.

VIDEO EXAMPLE

Solve $3a - 2(a - 9) = 4 + 2a$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/yU1vS11rTgk?si=E3PSiwDE0lqMSAno&t=1273

Answer: $a = 14$

1. Solve: $x - 14 = 11$

Answer: $x = 25$

2. Solve: $a + 9 = -6$

Answer: $a = -15$

3. Solve: $18 = n + 7$

Answer: $n = 11$

4. Solve: $4r - r = -21$

Answer: $r = -7$

5. Solve: $-5 = 6 + p$

Answer: $p = -11$

6. Solve: $\frac{q}{3} = -4 + 1$

Answer: $q = -9$

7. Solve: $12y - 8 - 5y = 13$

Answer: $y = 3$

8. Solve: $3x + 2 = x + 14$

Answer: $x = 6$

9. Solve: $5z - 7 = 2z + 11$

Answer: $z = 6$

10. Solve: $4(2m - 1) = 20$

Answer: $m = 3$

11. Solve: $7 = 3(k + 5) - 2$

Answer: $k = -2$

12. Solve: $6(2x - 1) = 9x + 12$

Answer: $x = 6$

13. Solve: $-4(n - 3) = 2n + 6$

Answer: $n = 1$

14. Solve: $5(3y - 2) = 2y + 31$

Answer: $y = \frac{41}{13}$

Module 1D Translating Word Phrases to Math

Turn everyday phrases into math expressions so words like sum, product, and quotient start to feel more natural.

IN PLAIN TERMS

This topic turns word phrases into math expressions by matching operation words to symbols.

KEY PARTS

- Words like sum, difference, product, and quotient point to operations.
- Order matters in phrases like less than and subtracted from.
- Parentheses help keep grouped ideas together.

RULES AND FORMULAS

- More than usually means add.
- Less than reverses the order you may expect.
- Quotient means divide, and product means multiply.

LOOK FOR: operation words and order words, especially phrases like less than or subtracted from.

VIDEO EXAMPLE

Translate: five more than a number.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/Uc44b2PU9Yo?si=BA9tAI3YMwGYJrU6&t=7

Answer: $x + 5$

1. Write an expression for: the sum of -8 and a number.

Answer: $-8 + x$

2. Write an expression for: thirteen less than a number.

Answer: $x - 13$

3. Write an expression for: the product of -6 and a number.

Answer: $-6x$

4. Write an expression for: a number divided by 12.

Answer: $\frac{x}{12}$

5. Write an expression for: the quotient of 9 and a number, increased by 4.

Answer: $\frac{9}{x} + 4$

6. Write an expression for: negative 20 decreased by 3 times a number.

Answer: $-20 - 3x$

7. Write an expression for: twice a number, increased by 15.

Answer: $2x + 15$

8. Write an expression for: the difference of 11 and a number.

Answer: $11 - x$

9. Write an expression for: a number subtracted from 22.

Answer: $22 - x$

10. Write an expression for: the product of 14 and a number, then add 6.

Answer: $14x + 6$

11. Write an expression for: eight times a number, decreased by 31.

Answer: $8x - 31$

12. Write an expression for: the quotient of 18 and the product of a number and -3.

Answer: $\frac{18}{-3x}$

13. Write an expression for: the product of -12 and the sum of a number and 5.

Answer: $-12(x + 5)$

14. Write an expression for: seven times the sum of a number and -4.

Answer: $7(x - 4)$

Module 1E More Translating and Problem Solving

Take word statements and short stories and turn them into equations that match what is happening.

IN PLAIN TERMS

These problems turn short real-life situations into equations and then solve them.

KEY PARTS

- Start by choosing a variable for the unknown.
- Translate the story into one equation.
- The final answer should match what the question asks for.

RULES AND FORMULAS

- Total problems often add parts together.
- Comparison problems use phrases like more than, less than, or times as many.
- Check whether your answer makes sense in the story.

LOOK FOR: what the variable stands for and whether the question wants the smaller amount, larger amount, or total.

VIDEO EXAMPLE

Translate and solve: three times a number increased by 4 is 22.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/Uc44b2PU9Yo?si=eFj3kDCCZhG8bBfr&t=72

Answer: **Equation:** $3x + 4 = 22$, **so** $x = 6$.

VIDEO EXAMPLE

The length of a rectangular garden is 5 feet more than twice the width. If the perimeter of the garden is 148 feet, find the dimensions of the garden.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/ALkSvI844Gk?si=UibLRdKk40-OMV9i&t=61

Answer: **Equation:** $6x + 10 = 148$. **The width is 23 feet and the length is 51 feet.**

1. Write an equation and solve: a number increased by 13 gives -20.

Answer: **Equation:** $x + 13 = -20$, **so** $x = -33$.

2. Write an equation and solve: sixteen less than a number is 41.

Answer: **Equation:** $x - 16 = 41$, **so** $x = 57$.

3. Write an equation and solve: six times a number is 84.

Answer: **Equation:** $6x = 84$, **so** $x = 14$.

4. Write an equation and solve: the quotient of 35 and a number is 5.

Answer: **Equation:** $\frac{35}{x} = 5$, **so** $x = 7$.

5. Write an equation and solve: eleven subtracted from eight times a number gives 45.

Answer: Equation: $8x - 11 = 45$, so $x = 7$.

6. Write an equation and solve: three times 4 less than a number is 24.

Answer: Equation: $3(x - 4) = 24$, so $x = 12$.

7. Maya has four times as many stickers as Leo. Together they have 85 stickers. How many stickers does Maya have?

Answer: Let x be Leo's stickers. Then Maya has $4x$, so $x + 4x = 85$. That gives $x = 17$, so Maya has 68 stickers.

8. A manager earns twice the salary of an assistant. Together they earn $78,000. What is each salary?

Answer: Let x be the assistant's salary. Then the manager earns $2x$, so $x + 2x = 78000$. The assistant earns $26,000 and the manager earns $52,000.

9. Elena sold a desk and a lamp for $540 total. She got five times as much for the desk as for the lamp. How much did she get for the desk?

Answer: Let x be the amount for the lamp. Then the desk sold for $5x$, so $x + 5x = 540$. The lamp sold for $90, so the desk sold for $450.

10. One movie theater has 180 more seats than another. Together they have 920 seats. How many seats does each theater have?

Answer: Let x be the smaller theater. Then the larger has $x + 180$, so $x + x + 180 = 920$. The smaller theater has 370 seats and the larger theater has 550 seats.

11. A club has 412 students. There are 36 more seventh graders than eighth graders. How many seventh graders are in the club?

Answer: Let x be the number of eighth graders. Then seventh graders are $x + 36$, so $x + x + 36 = 412$. That gives $x = 188$, so there are 224 seventh graders.

12. A rope is cut into two pieces. One piece is 9 feet longer than the other, and together they measure 51 feet. How long is the longer piece?

Answer: Let x be the shorter piece. Then the longer piece is $x + 9$, so $x + x + 9 = 51$. The shorter piece is 21 feet, so the longer piece is 30 feet.

Module 1F Solving Equations and Simplifying Expressions With Fractions

These are the same equation ideas as before, just with fractions added so the work looks a little busier.

IN PLAIN TERMS

This topic keeps the same equation ideas but adds fractions, so careful arithmetic matters more.

KEY PARTS

- The algebra steps are the same as before, but the arithmetic uses fractions.
- Common denominators help when adding or subtracting fractions.
- Fraction answers should be simplified at the end.

RULES AND FORMULAS

- Find a common denominator before combining fraction terms.
- Distribute through parentheses carefully when fractions are involved.
- You can clear fractions if that makes the equation easier to solve.

LOOK FOR: common denominators, sign mistakes, and whether the final answer can be simplified more.

VIDEO EXAMPLE

Solve $\frac{3}{2}x - \frac{4}{3} = \frac{8}{9}$

SCAN FOR VIDEO WALKTHROUGH

www.youtube.com/shorts/mM54CTDOW08

Answer: $x = \frac{40}{27}$

VIDEO EXAMPLE

Solve $x - \frac{3}{4} = \frac{5}{2}$

SCAN FOR VIDEO WALKTHROUGH

youtu.be/SSJ_m8dU_Yg?si=SveFkV0mJSfhMiLI&t=49

Answer: $x = \frac{13}{4}$

VIDEO EXAMPLE

Solve $\frac{1}{4}p - \frac{3}{8}p = 4$

SCAN FOR VIDEO WALKTHROUGH

youtu.be/SSJ_m8dU_Yg?si=Ac2QJS-AY60G4_WJ&t=397

Answer: $p = -32$

VIDEO EXAMPLE

Solve $-\frac{3}{4}(8x-12)=\frac{5}{6}(6x+12)$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/SSJ_m8dU_Yg?si=sSl8V-YgC5U6RsN9&t=705

Answer: $x=-\frac{1}{11}$

VIDEO EXAMPLE

Solve $\frac{1}{3}(r+6)=\frac{1}{6}(r+8)$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/SSJ_m8dU_Yg?si=NL1ouOqUBwp_tAdC&t=980

Answer: $r=-4$

1. Solve: $x-\frac{7}{10}=-\frac{1}{5}$

Answer: $x=\frac{1}{2}$

2. Solve: $y+\frac{3}{8}=\frac{1}{4}$

Answer: $y=-\frac{1}{8}$

3. Solve: $-\frac{2}{9}+n=\frac{5}{9}$

Answer: $n=\frac{7}{9}$

4. Solve: $q+\frac{4}{5}=-\frac{1}{10}$

Answer: $q=-\frac{9}{10}$

5. Solve: $3x-\frac{1}{2}=\frac{5}{2}$

Answer: $x=1$

6. Solve: $4m+\frac{2}{3}-m=\frac{5}{3}$

Answer: $m=\frac{1}{3}$

7. Solve: $5p - \frac{3}{4} = \frac{1}{4}$

Answer: $p = \frac{1}{5}$

8. Solve: $-6r = \frac{7}{3}$

Answer: $r = -\frac{7}{18}$

9. Solve: $\frac{2}{5}t = -\frac{8}{15}$

Answer: $t = -\frac{4}{3}$

10. Solve: $\frac{x}{4} - x = -\frac{3}{2}$

Answer: $x = 2$

11. Solve: $\frac{2}{3} - \frac{z}{6} = \frac{1}{2}$

Answer: $z = 1$

12. Solve: $\frac{x}{7} = \frac{x}{2} + \frac{5}{14}$

Answer: $x = -1$

13. Solve: $\frac{5}{4} + \frac{a}{3} = \frac{1}{6}$

Answer: $a = -\frac{13}{4}$

14. Solve: $3b - 2b = \frac{1}{2}$

Answer: $b = \frac{1}{2}$

15. Simplify: $\frac{z}{6} - \frac{5}{12}$

Answer: $\frac{2z - 5}{12}$

16. Simplify: $\frac{3m}{10} + \frac{m}{4}$

Answer: $\frac{11m}{20}$

Module 1G Decimals Intro

Read, write, and convert decimals so place value and decimal notation start to feel more familiar.

IN PLAIN TERMS

This topic builds comfort with reading, writing, and converting decimals using place value.

KEY PARTS

- Digits to the right of the decimal show tenths, hundredths, and thousandths.
- Decimals can be written as words, fractions, or mixed numbers.
- Place value tells you what each digit means.

RULES AND FORMULAS

- Use the place value as the denominator when writing a decimal as a fraction.
- Simplify the fraction after converting.
- Read the whole-number part and decimal part separately when writing words.

LOOK FOR: how many decimal places there are and what place value name matches them.

VIDEO EXAMPLE

Write 31.2 as a simplified fraction and mixed number.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/__rI2A0nGSo?si=09H_-xEx7vENpWu5&t=299

Answer: $\frac{156}{5} = 31\frac{1}{5}$

1. Write in decimal form: nine and twenty-four hundredths.

Answer: 9.24

2. Write in decimal form: fifteen and three hundred eight thousandths.

Answer: 15.308

3. Write in decimal form: forty-seven hundredths.

Answer: 0.47

4. Write in decimal form: eight hundred twelve thousandths.

Answer: 0.812

5. Write in decimal form: six and five thousandths.

Answer: 6.005

6. Write in decimal form: twelve and six tenths.

Answer: 12.6

7. Write in decimal form: one hundred three and nine tenths.

Answer: 103.9

8. Write in decimal form: negative seven and forty-two thousandths.

Answer: -7.042

9. Write as a fraction or mixed number: 0.4

Answer: $\frac{2}{5}$

10. Write as a fraction or mixed number: -0.125

Answer: $-\frac{1}{8}$

11. Write as a fraction or mixed number: 0.36

Answer: $\frac{9}{25}$

12. Write as a fraction or mixed number: 1.2

Answer: $1\frac{1}{5}$

13. Write as a fraction or mixed number: 3.75

Answer: $3\frac{3}{4}$

14. Write as a fraction or mixed number: 2.04

Answer: $2\frac{1}{25}$

15. Write 8.59 in words.

Answer: Eight and fifty-nine hundredths

16. Write -0.408 in words.

Answer: Negative four hundred eight thousandths

17. Write 12.307 in words.

Answer: Twelve and three hundred seven thousandths

18. Write -6.4 in words.

Answer: Negative six and four tenths

Module 1H Rounding Decimals

This topic is about rounding decimals to the right place and knowing which digit tells you what to do.

IN PLAIN TERMS

Rounding keeps the place you need and uses the next digit to decide whether to stay or go up.

KEY PARTS

- Find the place you are rounding to first.
- Only the digit immediately to the right decides what happens.
- Money problems may ask for cents or whole dollars.

RULES AND FORMULAS

- If the next digit is 5 or more, round up.
- If the next digit is 4 or less, stay the same.
- Keep the correct number of decimal places in the final answer.

LOOK FOR: the requested place value and the one digit directly to its right.

VIDEO EXAMPLE

Round 58.3794 to the nearest tenth.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=_LROTdctrlqBJ4x6&t=111

Answer: 58.4

VIDEO EXAMPLE

Round 58.3794 to the nearest hundredth.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=hbT9wtsYnPLdkk-M&t=176

Answer: 58.38

VIDEO EXAMPLE

Round 5,749.449 to the nearest tenth.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=v9MsgmaIQPK8nwpy&t=213

Answer: 5,749.4

VIDEO EXAMPLE

Round $348.47 to the nearest tenth.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=gA2JxzYhVtoodWC0&t=301

Answer: $348.50

VIDEO EXAMPLE

Round $348.47 to the nearest dollar.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=daSMeyE8ddKk1zDf&t=356

Answer: $348

VIDEO EXAMPLE

Round $21.95 to the nearest tenth.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=LxNkgdT00TQf30E_&t=422

Answer: $22.00

VIDEO EXAMPLE

Round 5,743.897 to the nearest hundred.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/fDN0m8fTTMI?si=NeqpHooianGFvYpP&t=599

Answer: 5,700

1. Round 58.7 to the nearest one.

Answer: 59

2. Round 6.284 to the nearest hundredth.

Answer: 6.28

3. Round 84.1 to the nearest ten.

Answer: 80

4. Round 91.3874 to the nearest hundredth.

Answer: 91.39

5. Round 3.96 to the nearest tenth.

Answer: 4.0

6. Round 9.142 to the nearest tenth.

Answer: 9.1

7. Round 12.7846 to the nearest thousandth.

Answer: 12.785

8. Round 4.20598 to the nearest thousandth.

Answer: 4.206

9. Round $0.784 to the nearest cent.

Answer: $0.78

10. Round $18.52 to the nearest dollar.

Answer: $19

11. Round $6.436 to the nearest cent.

Answer: $6.44

12. Round $482.49 to the nearest dollar.

Answer: $482

13. Round $0.0567 to the nearest cent.

Answer: $0.06

14. Round $125.51 to the nearest dollar.

Answer: $126

Module 1I Decimal Problem Solving and Geometry

Use decimals in real-life problems and simple geometry so the numbers feel more practical.

IN PLAIN TERMS

This topic uses decimals in practical settings like shopping, wages, measurements, and geometry.

KEY PARTS

- Decimal operations show up in money, pay, measurements, and geometry.
- Some problems ask for perimeter or circumference from measured values.
- Unit labels help keep the story clear.

RULES AND FORMULAS

- Line up decimal points when adding or subtracting.
- Use multiplication or division for rates, prices, and pay.
- Use the requested value of π when the problem asks for an approximation.

LOOK FOR: which operation fits the story and what unit the final answer should be written in.

VIDEO EXAMPLE

If 3 apples cost $4, how much does one apple cost?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/PuBrAxwaw38?si=YtSej1kC5AHS5T92&t=1992

Answer: One apple costs about $1.33.

VIDEO EXAMPLE

Calculate weekly pay for $10.92 an hour and 35 hours of work.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/PuBrAxwaw38?si=O4WDxbTrqh98nfLY&t=2207

Answer: The exact weekly pay is $382.20 before taxes.

1. Elena bought a science book for $27.48. She paid with two $20 bills. How much change should she receive?

Answer: $12.52

2. During one week in April, a town recorded 1.48 inches of rain on Monday, 0.95 inches on Wednesday, and 2.37 inches on Friday. No rain fell on the other days. What was the total rainfall for the week?

Answer: 4.80 inches

3. A race car was traveling 128.406 mph at the end of one lap and 161.982 mph at the end of the next lap. How much faster was the car moving at the end of the second lap?

Answer: 33.576 mph

4. A triangular flower bed has side lengths of 7.9 feet, 12.35 feet, and 14.6 feet. How much border trim is needed to go all the way around it?

Answer: 34.85 feet

5. Marcus earns $11.24 per hour. He worked 26 hours last week. What was his pay before taxes?

Answer: $292.24

6. A farmer sold 7,200 baskets of peaches for $3.85 per basket. How much money did the farmer receive?

Answer: $27,720.00

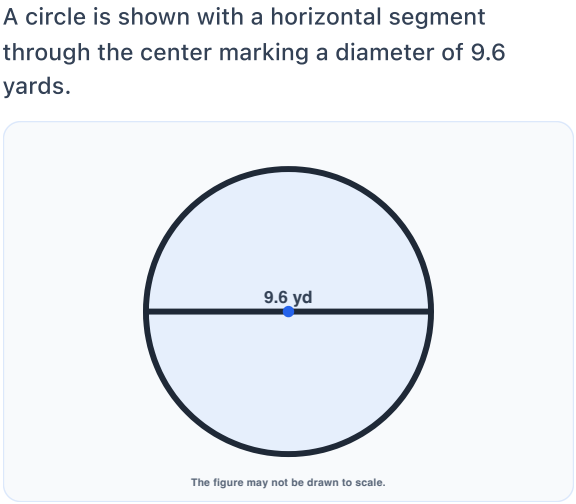
7. Nina spent $14.08 on gasoline. If gas cost $1.76 per gallon, how many gallons did she buy? Round to the nearest tenth if needed.

Answer: 8 gallons

8. A tank of water weighs 6,631.25 pounds. One cubic foot of water weighs 62.5 pounds. How many cubic feet of water are in the tank? Round to the nearest hundredth.

Answer: 106.10 cubic feet

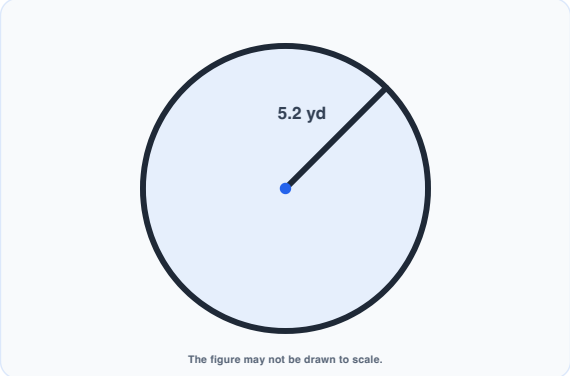
9. Find the exact circumference, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.



Answer: Exact circumference: 9.6π yards; approximate circumference using 3.14: 30.144 yards; approximate circumference using $\frac{22}{7}$: $30\frac{6}{35}$ yards

10. Find the exact circumference, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

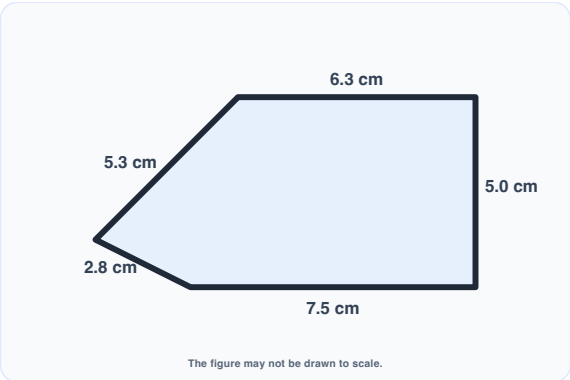
A circle is shown with a segment from the center to the edge marking a radius of 5.2 yards.



Answer: Exact circumference: 10.4π yards; approximate circumference using 3.14: 32.656 yards; approximate circumference using $\frac{22}{7}$: $32\frac{24}{35}$ yards

11. Find the perimeter of the figure below.

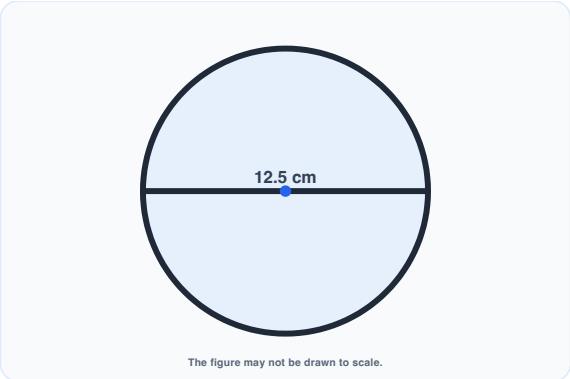
A five-sided polygon is shown with side lengths labeled 5.3 centimeters, 6.3 centimeters, 5.0 centimeters, 7.5 centimeters, and 2.8 centimeters.



Answer: 26.9 centimeters

12. Find the exact circumference in terms of π, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

A circle is shown with a horizontal segment through the center marking a diameter of 12.5 centimeters.



Answer: Exact circumference: 12.5π centimeters; approximate circumference using 3.14: 39.25 centimeters; approximate circumference using $\frac{22}{7}$: $39\frac{2}{7}$ centimeters

13. A square has side length 7.17 meters. What is its perimeter?

Answer: 28.68 meters

14. A phone screen measures 4.75 inches by 1.5 inches. What is the perimeter of the rectangular screen?

Answer: 12.5 inches

Module 1J Solving Equations With Decimals

Solve equations with decimals while keeping the arithmetic lined up and easy to follow.

IN PLAIN TERMS

This topic solves equations with decimals while using the same balance rules as earlier algebra.

KEY PARTS

- These are equation problems with decimal coefficients and constants.
- You still solve by keeping both sides balanced.
- Decimal arithmetic needs careful alignment.

RULES AND FORMULAS

- Combine like terms before isolating the variable.
- You can clear decimals if that makes the work easier.
- Check your answer in the original equation when possible.

LOOK FOR: simplify first, keep decimal work neat, and watch for sign errors.

1. Solve: $-3.4 = 18.6 - x$

Answer: $x = 22$

2. Solve: $-8.4 = -2.1x$

Answer: $x = 4$

3. Solve: $8x + 14.4 = 3x - 5.6$

Answer: $x = -4$

4. Solve: $1.6x + 2.8 = 0.9x + 1.12$

Answer: $x = -2.4$

5. Solve: $1.4x - 2.7 = 0.8x + 1.5$

Answer: $x = 7$

6. Solve: $x + 3.7 = 9.4$

Answer: $x = 5.7$

7. Solve: $6.2 = y - 1.9$

Answer: $y = 8.1$

8. Solve: $4(x - 1.2) = 8.8$

Answer: $x = 3.4$

9. Solve: $0.3x + 0.9 = -0.6$

Answer: $x = -5$

10. Solve: $1.5x - 2.4 - 0.5x = 5.6$

Answer: $x = 8$

11. Solve: $-0.8x + 1.6 = -0.2x + 3.4$

Answer: $x = -3$

12. Solve: $4(2x - 0.5) = 6x + 1$

Answer: $x = 1.5$

Module 1K Mean, Median, Mode, and Range

This topic is about the four basic ways to describe a data set and what each one tells you.

IN PLAIN TERMS

These measures help describe what a data set looks like from its center and its spread.

KEY PARTS

- Mean uses the total of the data values.
- Median depends on the ordered list.
- Mode and range describe common value and spread.

RULES AND FORMULAS

- Order the data before finding the median.
- Range = greatest value minus least value.
- A data set can have one mode, more than one mode, or no mode.

LOOK FOR: whether the question wants the average, middle, most common value, or spread of the data.

VIDEO EXAMPLE

Find the mean, median, mode, and range for 74, 81, 92, 68, 66, 97, 81, 74.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/P-rYFf_91xc?si=5iS1q66ECeEAw_Fd&t=65

Answer: **Mean = 79.125, median = 77.5, mode = 74 and 81, range = 31**

1. The following test scores were recorded for a student: 84, 76, 92, 76, 88, 94. Find the mean, median, mode, and range.

Answer: **Mean = 85, median = 86, mode = 76, range = 18**

2. The following test scores were recorded for a student: 91, 73, 85, 73, 89. Find the mean, median, mode, and range.

Answer: **Mean = 82.2, median = 85, mode = 73, range = 18**

3. Find the GPA for grades B in 5 credits, C in 2 credits, A in 3 credits, and C in 5 credits. Use A = 4, B = 3, C = 2, D = 1, and F = 0.

Answer: **GPA = 2.73**

4. Find the GPA for grades C in 3 credits, C in 3 credits, C in 4 credits, C in 1 credit, and D in 2 credits. Use A = 4, B = 3, C = 2, D = 1, and F = 0.

Answer: **GPA = 1.85**

5. During an experiment, the following times in seconds were recorded: 7.9, 7, 7.6, 4.8, 7, 7.1. Find the mean.

Answer: **Mean = 6.9**

6. During an experiment, the following times in seconds were recorded: 7.2, 6.3, 6.9, 4.1, 6.3, 6.4. Find the mode.

Answer: **Mode = 6.3**

7. The following test scores were recorded for a student: 89, 98, 94, 77, 80, 88. Find the median.

Answer: Median = 88.5

Module 2: Ratios, Percents, and Money

Module 2 focuses on ratios, proportions, percent conversions, percent applications, and money topics such as tax, discount, commission, and interest.

Module 2A Ratios and Proportions

Ratios compare two amounts, and proportions help you scale those comparisons up or down.

IN PLAIN TERMS

This topic is about comparing amounts and using those comparisons to find missing values.

KEY PARTS

- Ratios compare two amounts.
- Proportions say two ratios are equal.
- Many real problems use a constant comparison to scale up or down.

RULES AND FORMULAS

- Simplify ratios when possible.
- In a true proportion, cross products match.
- Keep the order of the quantities consistent.

LOOK FOR: which two quantities are being compared and whether the comparison stays the same.

VIDEO EXAMPLE

A flagpole casts a shadow that is 40 feet long. At the same time, a child that is 4.5 feet tall casts a shadow that is 6 feet long. How tall is the flagpole?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/gVq1oQIg9Is

Answer: The flagpole is 30 feet tall.

VIDEO EXAMPLE

Jack is a car salesman. On average, one out of every three customers that see him end up purchasing a vehicle. At this rate, how many vehicles can Jack expect to sell if he works with 36 customers in a month?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/ifh6DVNsURo?si=ZQCgaZcuCIvNzG4M&t=87

Answer: Jack can expect to sell 12 vehicles.

VIDEO EXAMPLE

A cell phone company found an average of 3 defective phones for every 500 that rolled off the assembly line. If the company made 150,000 phones, how many can they expect to be defective?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/ifh6DVNsURo?si=tGpzgw-7e4DIq8oT&t=567

Answer: They can expect 900 defective phones.

VIDEO EXAMPLE

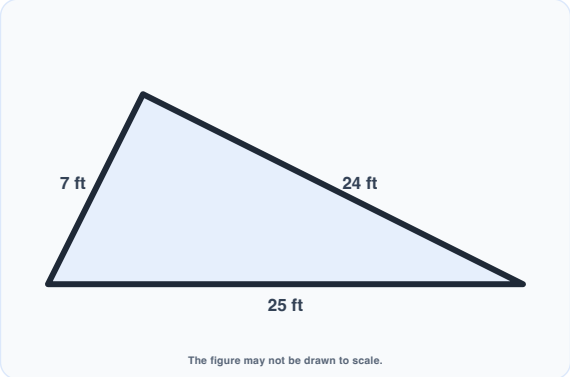
Of the 250 people at a convention, 130 of them are women. Find the ratio of women to total people, men to total people, women to men, and men to women.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/7tNjJAqtC98?si=qXhxiRynPQgU-ACb&t=34

Answer: **Women to total = 13:25, men to total = 12:25, women to men = 13:12, men to women = 12:13.**

1. Find the ratio of the longest side to the perimeter of the triangular sail.

A triangle is shown with its three side lengths labeled 7 feet, 24 feet, and 25 feet.



Answer: $\frac{25}{56}$

2. A dessert plate has a diameter of 8.4 inches and a serving platter has a diameter of 12.6 inches. Write the ratio of the smaller diameter to the larger diameter in simplest form.

Answer: $\frac{2}{3}$

3. Solve the proportion: $\frac{x}{9} = \frac{5}{6}$

Answer: $x = \frac{15}{2}$

4. Solve the proportion: $\frac{3x}{8} = \frac{9}{14}$

Answer: $x = \frac{12}{7}$

5. Solve the proportion: $\frac{x+3}{x+7} = \frac{4}{5}$

Answer: $x = 13$

6. Solve the proportion: $\frac{7}{4} = \frac{21}{n+1}$

Answer: $n = 11$

7. A trail mix uses a raisins-to-almonds ratio of 4 to 7. If a batch uses 28 cups of almonds, how many cups of raisins are needed?

Answer: 16 cups

8. A rice cooker recipe uses water and rice in a ratio of 3 to 2. If you use 9 cups of water, how many cups of rice should you use?

Answer: 6 cups

9. A granola blend has 150 calories per 40 grams. How many calories are in a 26-gram serving?

Answer: 97.5 calories

10. A paint mixture uses 6 cups of base paint for every 1 cup of tint. If you start with 42 cups of base paint, how many cups of tint are needed?

Answer: 7 cups

Module 2B Fractions, Decimals, and Percentages

This topic is all about moving back and forth between fractions, decimals, percents, and mixed numbers.

IN PLAIN TERMS

This topic helps students switch between fractions, decimals, percents, and mixed numbers without changing the meaning.

KEY PARTS

- Fractions, decimals, and percents can all name the same amount.
- Mixed numbers can also be written as percents or decimals.
- The goal is moving between forms without changing the value.

RULES AND FORMULAS

- Percent means out of 100.
- To change decimal to percent, move the decimal two places right.
- To change percent to decimal, move the decimal two places left.

LOOK FOR: whether the number should be written over 100, as a decimal, or simplified as a fraction.

VIDEO EXAMPLE

Write the decimal as a percent: 0.75

SCAN FOR VIDEO WALKTHROUGH

youtu.be/m_nnEYsEsRo?si=SsUsqS3UZKty-xNe&t=85

Answer: 75%

VIDEO EXAMPLE

Write the decimal as a percent: 0.09

SCAN FOR VIDEO WALKTHROUGH

youtu.be/m_nnEYsEsRo?si=X2wnZhqIg0wOYDm3&t=166

Answer: 9%

VIDEO EXAMPLE

Write the decimal as a percent: 2.63

SCAN FOR VIDEO WALKTHROUGH

youtu.be/m_nnEYsEsRo?si=Ayk2gm1Da5PID5ND&t=185

Answer: 263%

VIDEO EXAMPLE

Write the decimal as a percent: 0.6524

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=Whak3bU-_Prjfjpl&t=203

Answer: 65.24%

VIDEO EXAMPLE

Write the percent as a decimal: 42.7%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=-yk8KVNFUOLPKjFt&t=301

Answer: 0.427

VIDEO EXAMPLE

Write the percent as a decimal: 6.9%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=mEXVWT12ZjZa5e3g&t=355

Answer: 0.069

VIDEO EXAMPLE

Write the percent as a decimal: 371.12%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=g0F3k7EZeNOScSXC&t=388

Answer: 3.7112

VIDEO EXAMPLE

Write the decimal as a fraction: 0.5

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=FyMQBCuIhqSSMVQU&t=453

Answer: $\frac{1}{2}$

VIDEO EXAMPLE

Write the decimal as a fraction: 0.68

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=HJiMP5If5f7N-G_u&t=554

Answer: $\frac{17}{25}$

VIDEO EXAMPLE

Write the decimal as a fraction or mixed number: 4.554

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=brvQvbjxIPWPzOgS&t=638

Answer: $4\frac{277}{500} = \frac{2277}{500}$

VIDEO EXAMPLE

Write the fraction as a decimal: $\frac{17}{20}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=oZkROCJh5BiTjCwj&t=759

Answer: 0.85

VIDEO EXAMPLE

Write the fraction as a decimal: $\frac{37}{10}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=Pti2l_Jy7Olv1YJG&t=797

Answer: 3.7

VIDEO EXAMPLE

Write the fraction as a decimal: $\frac{4}{9}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=OZZeEt9bQ8rObvtT&t=811

Answer: 0.444...

VIDEO EXAMPLE

Write the fraction as a percent: $\frac{17}{20}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=QXmF-bLjjWckQ9wM&t=1020

Answer: 85%

VIDEO EXAMPLE

Write the fraction as a percent: $\frac{37}{10}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=cOrEcc8BIKSR_AY8&t=1130

Answer: 370%

VIDEO EXAMPLE

Write the fraction as a percent: $\frac{4}{9}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=dOZXTCMDfCMzVDfZ&t=1154

Answer: 44.444...%

VIDEO EXAMPLE

Write the fraction as a percent: $\frac{7}{9}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=GxObxCljict8nEWq&t=1186

Answer: 77.777...%

VIDEO EXAMPLE

Write the percent as a fraction: 75%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=F-jJzBZDUIR_NM7q&t=1324

Answer: $\frac{3}{4}$

VIDEO EXAMPLE

Write the percent as a fraction: 8%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=Rz008cyXM9svF7Zn&t=1409

Answer: $\frac{2}{25}$

VIDEO EXAMPLE

Write the percent as a fraction: 37.2%

SCAN FOR VIDEO WALKTHROUGH
youtu.be/m_nnEYsEsRo?si=uN7T0dNKxS758Auu&t=1476

Answer: $\frac{93}{250}$

VIDEO EXAMPLE

Write the fraction as a percent: $\frac{21}{12}$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=GnT5__fo7hwf0Etu&t=37

Answer: 175%

VIDEO EXAMPLE

Write the percent as a fraction: $8\frac{3}{5}\%$

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=J5AMdjxqZsEU8lnX&t=163

Answer: $\frac{43}{500}$

1. Write the percent as a decimal: 14%

Answer: 0.14

2. Write the percent as a decimal: 62.5%

Answer: 0.625

3. Write the percent as a decimal: 3.4%

Answer: 0.034

4. Write the percent as a fraction in simplest form: 12.5%

Answer: $\frac{1}{8}$

5. Write the percent as a fraction in simplest form: $2\frac{1}{2}\%$

Answer: $\frac{1}{40}$

6. Write the decimal as a percent: 0.47

Answer: 47%

7. Write the decimal as a percent: 0.008

Answer: 0.8%

8. Write the fraction as a percent: $\frac{7}{20}$

Answer: 35%

9. Write the fraction as a percent: $\frac{3}{8}$

Answer: 37.5%

10. Write the mixed number as a percent: $4\frac{1}{5}$

Answer: 420%

Module 2C Solving Percent Problems

Percent problems usually ask for the part, the whole, or the percent, and this topic helps you tell which is which.

IN PLAIN TERMS

These problems are about figuring out whether you are finding the part, the whole, or the percent itself.

KEY PARTS

- Percent problems usually ask for the part, whole, or percent.
- You need to tell which quantity is missing before solving.
- The same relationship works across many different wordings.

RULES AND FORMULAS

- Part = percent times whole.
- Write the percent as a decimal before multiplying or dividing.
- When solving for the whole, divide by the decimal percent.

LOOK FOR: which number is the part, which number is the whole, and which value is the percent.

VIDEO EXAMPLE

What is 35% of 92?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/C1YCkS_0teg

Answer: 32.2

VIDEO EXAMPLE

What percent of 260 is 377?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/C1YCkS_0teg

Answer: 145%

VIDEO EXAMPLE

78% of what number is 244.92?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/C1YCkS_0teg

Answer: 314

VIDEO EXAMPLE

What is 85% of 32?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=Pt_HvvujHtvfWjN0&t=616

Answer: 27.2

VIDEO EXAMPLE

What percent of 64 is 80?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=2-a3mtILECBgkvj3&t=829

Answer: 125%

VIDEO EXAMPLE

Find a number such that 75% of that number is $\frac{228}{5}$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=5Trx_DsTMm1kBXyM&t=949

Answer: 60.8

1. What is 25% of 84?

Answer: 21

2. Fourteen is 35% of what number?

Answer: 40

3. What percent of 160 is 56?

Answer: 35%

4. What percent of 250 is 22.5?

Answer: 9%

5. What is 62% of 90?

Answer: 55.8

6. What number is 38% of 120?

Answer: 45.6

7. What percent of 48 is 30?

Answer: 62.5%

8. Twelve percent of what number is 54?

Answer: 450

9. 4.2 is 15% of what number?

Answer: 28

10. What is 3.6% of 250?

Answer: 9

Module 2D Percentage Applications, Increase, and Decrease

Use percents to describe how much something went up or down and what that change means in context.

IN PLAIN TERMS

This topic measures how much something increased or decreased compared with where it started.

KEY PARTS

- Percent increase compares how much something went up to the original amount.
- Percent decrease compares how much something went down to the original amount.
- Context tells whether you are describing growth or loss.

RULES AND FORMULAS

- Change = new amount minus original amount.
- Percent change = change divided by original amount.
- Multiply by 100 or convert to percent form at the end.

LOOK FOR: the original amount, the new amount, and whether the change is an increase or a decrease.

VIDEO EXAMPLE

The high temperature today was 66 degrees Fahrenheit. Yesterday, the high temperature was 95 degrees Fahrenheit. What is the percent decrease in temperature? Round to the nearest percent if necessary.

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/IZWq3Tdm_KI

Answer: 31%

VIDEO EXAMPLE

It has been reported that the revenue of a particular tablet in 2015 was approximately $54 million dollars. That same tablet produced only $46 million dollars in sales in 2016. What is the percent decrease in sales for this tablet from 2015 to 2016? Round to the nearest percent.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/mWRMiJNmcPc?si=Ox0NRG9LOOgX2Mxn&t=19

Answer: 15%

VIDEO EXAMPLE

A quality control inspector noticed that 1 out of every 400 light bulbs produced at a warehouse are defective. What percentage of the light bulbs produced are not defective?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=2col8aArl4BSOeTA&t=396

Answer: 99.75%

1. A student spent $54 on parking out of $360 in total semester fees. What percent of the total was spent on parking?

Answer: 15%

2. A bike rental shop averages 2,500 rentals each summer and expects a 28% increase next summer. How many rentals is that expected to be?

Answer: 3,200 rentals

3. A town had 845,000 residents. If the population decreases by 1.2%, what is the new population?

Answer: 834,860

4. A club gave out 48 gold badges out of 115 total badges. Approximately what percent of the badges were gold? Round to the nearest whole percent.

Answer: 42%

5. A home down payment of $45,000 represents 18% of the purchase price. What was the purchase price of the home?

Answer: $250,000

6. A contractor can bill 87% of a 40-hour week. How many hours can be billed?

Answer: 34.8 hours

7. A smoothie recipe used to have 180 calories and now has 120 calories. What is the percent decrease? Round to the nearest tenth if needed.

Answer: 33.3%

8. A typist improved from 36 words per minute to 81 words per minute. What is the percent increase?

Answer: 125%

9. A product line grew from 120 million devices to 438 million devices. What was the percent increase?

Answer: 265%

10. A school system had 4,200 thousand teachers and is projected to increase to 4,620 thousand teachers. What is the percent increase?

Answer: 10%

Module 2E Sales Tax, Commission, and Discount

These are the percent ideas that show up in shopping, pricing, and pay problems.

IN PLAIN TERMS

These are percent problems used in shopping, pricing, and earnings.

KEY PARTS

- Sales tax and commission are percent-of-a-number problems.
- Discount problems ask for what is taken off and what remains.
- These ideas show up in shopping and pay situations.

RULES AND FORMULAS

- Tax or commission = rate times original amount.
- Sale price = original price minus discount.
- Total with tax = original price plus tax.

LOOK FOR: whether the problem wants the extra amount, the amount taken off, or the final total.

VIDEO EXAMPLE

The cost of a meal, before tip and tax, was $88.24. The sales tax was 6.75%. The customer left a 20% tip. Assuming that both tip and tax were calculated based on the cost of the meal, what was total cost of the meal, including the tip and tax? Round to the nearest cent if necessary.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=1dyixrCDCQroOdNS&t=1327

Answer: $111.84

VIDEO EXAMPLE

A customer left $1,000 on the table at Pepper Jae's restaurant that covered the food, a 25% tip, and 6% sales tax. What was the cost of the food? Assume that both the tip and sales tax were calculated from the cost of the food. Round to the nearest cent if necessary.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=m-7_DjXsuSH_1qvL&t=1582

Answer: $763.36

VIDEO EXAMPLE

A necklace's retail price is $1499.99. The jewelry store that is selling it is having a sale where the customer gets a 25% discount. How much money will the customer save by purchasing the necklace during the sale? Round to the nearest dollar.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/DdIMGVFMTcA?si=zxFsZJYbicRB_8e9&t=2137

Answer: $375

VIDEO EXAMPLE

Sandra purchased a swimsuit on sale for $42.00. The original price of the swimsuit was $50.00. What was the discount rate?

SCAN FOR VIDEO WALKTHROUGH

youtu.be/DdIMGVFMTcA?si=0v6JOQYfzUGS8aZq&t=2347

Answer: 16%

1. What is the sales tax on a bike helmet priced at $68 if the tax rate is 7.5%?

Answer: $5.10

2. The purchase price of a tablet is $480. What is the total price if the sales tax rate is 6.25%?

Answer: $510.00

3. A sofa purchase had $126.00 in sales tax on a $1,800 purchase. What was the sales tax rate?

Answer: 7%

4. The sales tax on a grill is $12.96. If the tax rate is 8.1%, find the purchase price and the total price.

Answer: Purchase price = $160.00; total price = $172.96

5. The sales tax on a bookshelf is $42.84. If the tax rate is 6%, what was the purchase price?

Answer: $714

6. Maya bought sandals for $24, a shirt for $18, and sunglasses for $32. If the tax rate is 8%, find the total sales tax and the final total.

Answer: Sales tax = $5.92; final total = $79.92

7. A sales associate earns a 9% commission. What commission is earned on $185,400 in sales?

Answer: $16,686

8. A salesperson earned $1,248 in commission after selling $15,600 worth of equipment. What was the commission rate?

Answer: 8%

9. A desk originally costs $950 and is marked 18% off. Find the discount and the sale price.

Answer: Discount = $171.00; sale price = $779.00

10. A pair of wireless headphones costs $240 and is on sale for 25% off. Find the amount of the discount and the sale price.

Answer: Discount = $60; sale price = $180

Module 2F Simple and Compound Interest

This topic shows how money grows over time with simple interest and compound interest.

IN PLAIN TERMS

This topic is about how money grows over time, either by adding the same interest each time or by compounding.

KEY PARTS

- Simple interest grows by the same amount each period.
- Compound interest grows because interest is added back in again and again.
- Time and rate must match the way the problem is written.

RULES AND FORMULAS

- Simple interest: $I = Prt$.
- Total with simple interest = principal plus interest.
- Compound interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where P is principal, r is annual rate, n is compounds per year, and t is time in years.

LOOK FOR: whether the problem is simple interest or compound interest, and what amount the question wants in the end.

VIDEO EXAMPLE

A credit union offers a 3-year certificate of deposit with an annual interest rate of 3.6%, compounded quarterly. You deposit $9,500 into the CD and leave it untouched for the full 3 years. How much interest will you earn by the end of the term? Round to the nearest cent.

SCAN FOR VIDEO WALKTHROUGH
youtube.com/shorts/fIgNM-GVI2s?feature=share

Answer: $1,078.34

1. Find the simple interest on $3,200 at 7% for 4 years.

Answer: $896

2. Find the simple interest on $540 at 8% for 8 months.

Answer: $28.80

3. Find the total amount received on an investment of $6,800 at a simple interest rate of 4.5% for 18 months.

Answer: $7,259.00

4. A borrower takes out $9,500 for 6 years at a simple interest rate of 8%. What total amount is repaid?

Answer: $14,060

5. Find the total amount in a compound interest account: $3,000 compounded annually at 5% for 4 years. Round to the nearest cent.

Answer: $3,646.52

6. Find the total amount in a compound interest account: $2,500 compounded quarterly at 8% for 3 years. Round to the nearest cent.

Answer: $3,170.60

7. Find the total amount in a compound interest account: $1,800 compounded monthly at 4.8% for 2 years. Round to the nearest cent.

Answer: $1,980.99

8. Find the total amount in a compound interest account: $1,200 compounded daily at 6% for 1 year. Use 365 days. Round to the nearest cent.

Answer: $1,274.20

Module 3: Graphs, Roots, and Probability

Module 3 moves through pictographs, bar graphs, histograms, line graphs, and circle graphs before shifting into square roots, the Pythagorean theorem, probability, and measures of central tendency.

Module 3A Pictographs

Pictographs use pictures with a key, so the main job is reading the key correctly and comparing totals.

IN PLAIN TERMS

This topic is about reading picture-based graphs by turning the symbols into actual amounts.

KEY PARTS

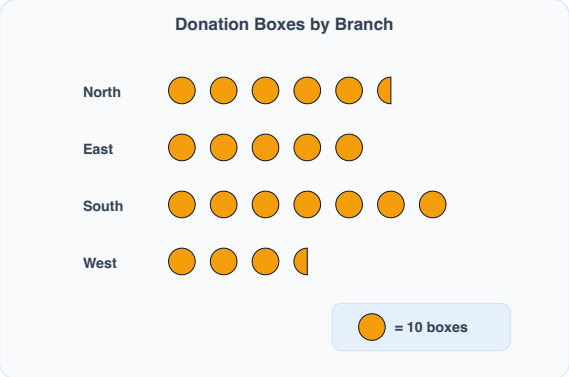
- Pictographs use repeated pictures to show data.
- The key tells how much each picture is worth.
- Some pictures may count as only part of a full symbol.

RULES AND FORMULAS

- Read the key before counting anything.
- Add picture values to find totals.
- Compare totals only after converting the pictures into numbers.

LOOK FOR: the key, any partial symbols, and the total value each row really represents.

Use the pictograph to answer questions 1 through 4. Each circle in the key represents 10 boxes.



1. Which branch collected the greatest number of donation boxes?

Answer: **The South branch**

2. How many boxes did the East branch collect?

Answer: **50 boxes**

3. How many more boxes did the South branch collect than the West branch?

Answer: **35 boxes**

4. What fraction of all the boxes shown came from the South branch?

Answer: $\frac{1}{3}$

Module 3B Bar Graphs

Bar graphs make it easy to compare categories, spot the biggest and smallest values, and read totals from a scale.

IN PLAIN TERMS

Bar graphs let you compare groups quickly by reading the height of each bar on a scale.

KEY PARTS

- Bar graphs compare categories.
- Each bar height shows the value for one group.
- The scale tells how to read the heights correctly.

RULES AND FORMULAS

- Read the axis labels and units first.
- Compare bar heights to answer greater-than or less-than questions.
- Use the scale, not the picture size, to read the numbers.

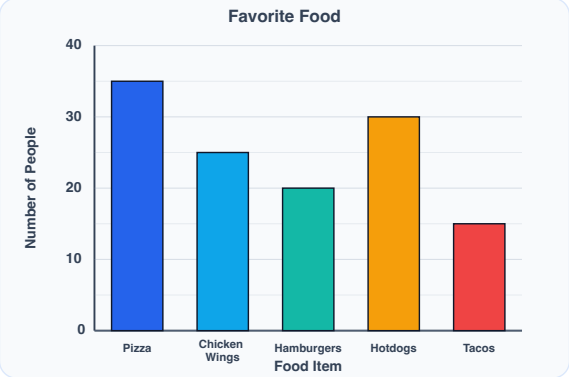
LOOK FOR: the category names, the scale marks, and whether the question wants one value, a difference, or a total.

VIDEO EXAMPLE

At a local dive bar, customers were asked what their favorite item was on the menu. What percentage of the people chose chicken wings or tacos?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/qahdnlyq7Os

The bar graph compares how many students chose pizza, chicken wings, hamburgers, hotdogs, and tacos. Pizza and chicken wings have the tallest bars, and hotdogs has the shortest bar.



Answer: 32%

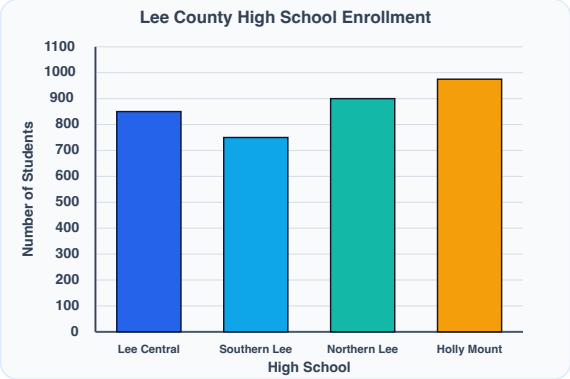
VIDEO EXAMPLE

There are four high schools in Lee County. The enrollment numbers are shown in the graph below. What is the approximate percentage of high school students in Lee County that attends Lee Central High School? Round to the nearest tenth of a percent.

SCAN FOR VIDEO WALKTHROUGH

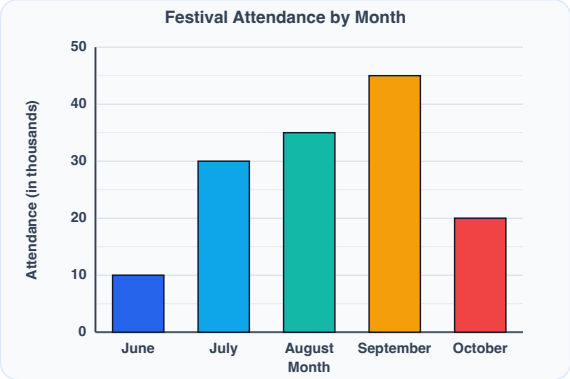
youtu.be/0LPYxG1zpz4?si=gU8xq7vt36jzBeED&t=17

The bar graph compares student enrollment at Lee Central, Southern Lee, Northern Lee, and Holly Mount on a scale from 0 to 1100 students. Holly Mount has the largest enrollment.



Answer: 24.5%

Use the festival attendance bar graph to answer questions 1 through 5. The y-axis is measured in thousands.



1. Which month had the greatest attendance?

Answer: September

2. How many people attended in October?

Answer: 20,000

3. How many more people attended in September than in July?
   Answer: 15,000

4. Which months had attendance of at least 30,000?
   Answer: July, August, and September

5. What was the combined attendance for June and October?
   Answer: 30,000

Module 3C Histograms

Histograms group data into intervals so you can see where values bunch up and where they spread out.

IN PLAIN TERMS

Histograms show how data is spread across intervals instead of listing each exact value.

KEY PARTS

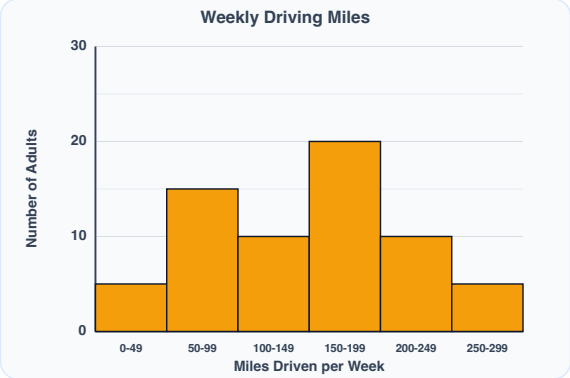
- Histograms group data into number intervals.
- Bars touch because the intervals are continuous.
- The height of each bar shows frequency.

RULES AND FORMULAS

- Read the interval labels carefully.
- Add frequencies when a question asks about more than one interval.
- Use the total number of data values when finding fractions or ratios.

LOOK FOR: which interval a question is asking about and how many data values fall into it.

Use the histogram to answer questions 1 through 5. Each bar shows how many adults fall within a driving-mile interval.



1. How many adults drove 150-199 miles per week?

Answer: 20

2. How many adults drove fewer than 150 miles per week?

Answer: 30

3. How many adults drove between 100 and 199 miles per week?

Answer: 30

4. What is the ratio of adults who drove 0-49 miles to the total number of adults surveyed?

Answer: $\frac{1}{13}$

5. How many more adults drove 150-199 miles than 250-299 miles?

Answer: 15

Module 3D Line Graphs

Line graphs show how something changes over time, so you can track rises, drops, and patterns.

IN PLAIN TERMS

Line graphs help students track how a quantity rises, falls, or stays steady across time or order.

KEY PARTS

- Line graphs show change over time or across an ordered set.
- Points show exact values and the line connects the pattern.
- You can read increases, decreases, highs, and lows from the graph.

RULES AND FORMULAS

- Read both axes before answering.
- Use the plotted point, not just the line direction, for exact values.
- Compare points to describe change from one time to another.

LOOK FOR: the axis labels, the highest and lowest points, and where the graph is increasing or decreasing.

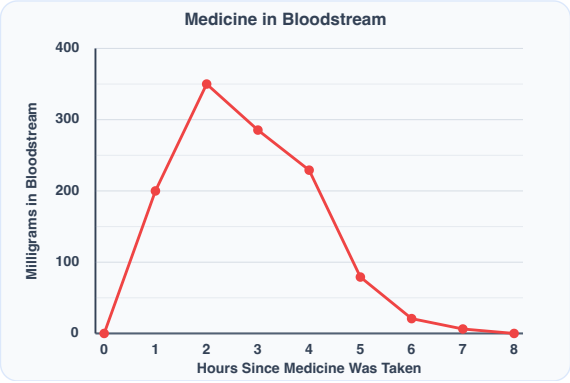
VIDEO EXAMPLE

The number of milligrams, y, of a particular medicine in the bloodstream, x hours after taking it is shown on the graph below. Determine if the following statements are true or false: a. The maximum amount of medicine in the bloodstream is 350 mg and occurs 2 hours after taking the medicine. b. There is no medicine in the bloodstream approximately 8 hours after taking it. c. There is more medicine in the bloodstream 1 hour after taking it as compared to 4 hours after taking it. d. The amount of medicine in the bloodstream increases for the first three hours and then decreases until there is no medicine in the bloodstream.

SCAN FOR VIDEO WALKTHROUGH

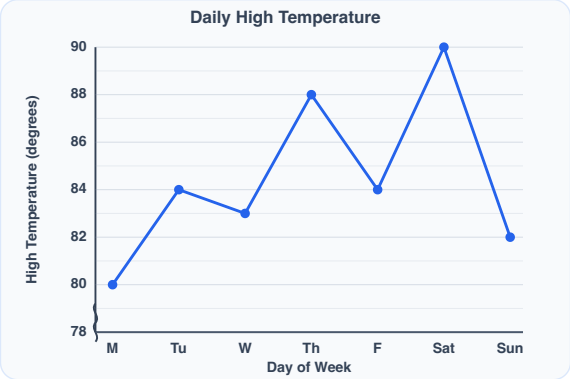
youtu.be/at0HWXY3VXI?si=gbci5o4bk-4Oju6g&t=20

The line graph shows the amount of medicine in the bloodstream from 0 to 8 hours. It rises to a maximum of 350 milligrams at 2 hours and then falls to 0 by 8 hours.



Answer: a. True; b. True; c. False; d. False.

Use the line graph to answer questions 1 through 5. The graph shows the daily high temperature from Monday through Sunday.



1. What was the high temperature on Thursday?

Answer: 88 degrees

2. During which day was the high temperature the greatest?

Answer: Saturday

3. From Tuesday to Wednesday, did the temperature increase or decrease?

Answer: It decreased.

4. Which days had a high temperature below 84 degrees?

Answer: Monday, Wednesday, and Sunday

5. What is the difference between the greatest and least temperatures shown?

Answer: 10 degrees

Module 3E Circle Graphs

Circle graphs show how a whole is split into parts, usually with percentages or pieces of the total.

IN PLAIN TERMS

Circle graphs are about reading how one whole is split into categories and turning those parts into useful numbers.

KEY PARTS

- Circle graphs show parts of one whole.
- Each slice represents a percent or fraction of the total.
- Several slices can be combined when a question asks about more than one category.

RULES AND FORMULAS

- The slices together must represent 100% of the whole.
- To find a count, multiply the percent by the total surveyed.
- Add slice percents before finding a combined amount.

LOOK FOR: which part of the whole a slice represents and whether the question wants a percent, a fraction, or an actual count.

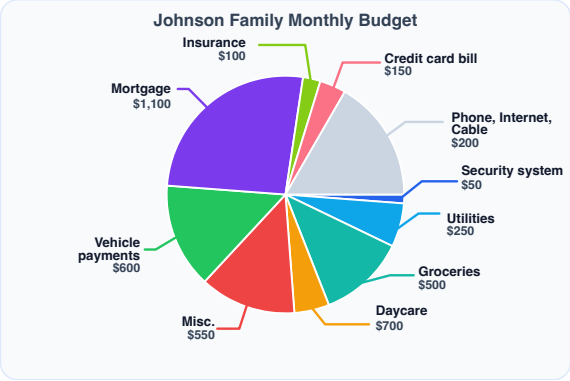
VIDEO EXAMPLE

The Johnson family's $4,200 monthly budget is shown in the pie chart below. What percent of their monthly budget is spent on groceries? Round to the nearest percent.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/nFbenBviymk?si=wRU4Vj5Dxganmtzi&t=16

The circle graph shows the Johnson family monthly budget split into ten categories. Mortgage is the largest expense at 1,100 dollars, and the security system is the smallest at 50 dollars.

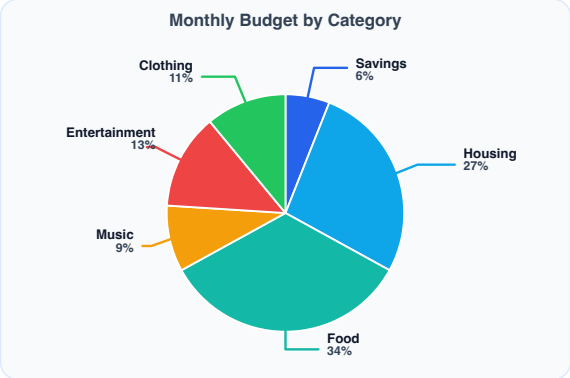


Answer: 12%

VIDEO EXAMPLE

A family brings home $12,200 each month. Use the circle graph to determine how much money is budgeted for each category.

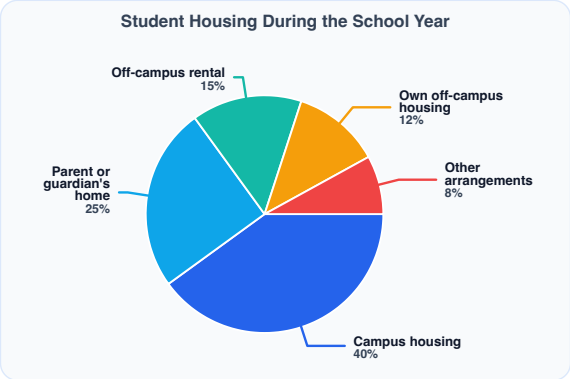
SCAN FOR VIDEO WALKTHROUGH
youtu.be/fipEf9Xzhn4?si=K1mN7s5rGRNQX_AF&t=11



Answer: **Savings: $732; Housing: $3,294; Food: $4,148; Music: $1,098; Entertainment: $1,586; Clothing: $1,342.**

A college surveyed 800 students about where they lived during the school year. Use the housing circle graph to answer questions 1 through 5.

The circle graph shows where surveyed students lived during the school year, with slices for on-campus housing, living with parents or family, renting off-campus housing, owning off-campus housing, and other arrangements.



1. Which category is the largest on the housing circle graph?

Answer: Campus housing

2. Write the ratio of students in campus housing to total students in simplest form.

Answer: $\frac{2}{5}$

3. What percent of students live in either an off-campus rental or their own off-campus housing?

Answer: 27%

4. If 800 students were surveyed, how many lived in a parent or guardian's home?

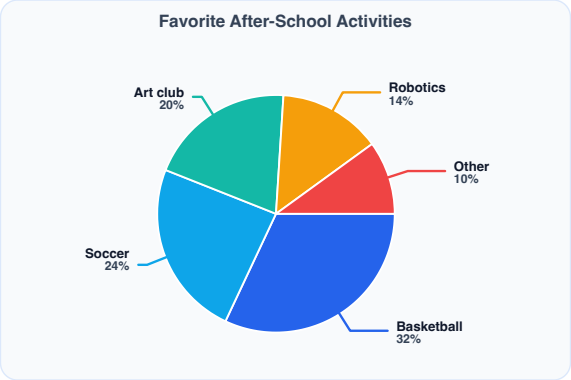
Answer: 200 students

5. If 800 students were surveyed, how many lived in either an off-campus rental or their own off-campus housing?

Answer: 216 students

A school surveyed students about their favorite after-school activities. Use the circle graph to answer questions 6 and 7.

The circle graph shows favorite after-school activities as basketball 32 percent, soccer 24 percent, art club 20 percent, robotics 14 percent, and other 10 percent.



6. What percent of students chose a sport as their favorite after-school activity?

Answer: 56%

7. If 90 students chose art club, how many students were surveyed in all?

Answer: 450 students

Module 3F Square Roots

Square roots undo squaring, so this topic focuses on perfect squares and close decimal estimates.

IN PLAIN TERMS

This topic is about finding the number that was multiplied by itself to make the value inside the root.

KEY PARTS

- Square roots undo squaring.
- Perfect squares give exact whole-number answers.
- Some roots need decimal approximations instead.

RULES AND FORMULAS

- $\sqrt{a^2} = a$ when using the principal square root.
- Break a fraction root into numerator and denominator when possible.
- Round only when the problem asks for an approximation.

LOOK FOR: whether the root is exact, whether it can be simplified, and when a decimal estimate is needed.

VIDEO EXAMPLE

Do you understand the relationship between squaring a number and taking the square root of a number?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/rp2ZTR5Dnes?si=F21kBaEu35jwwFsp

Answer: Watch the video. 👍

VIDEO EXAMPLE

What is the square root of 37? Notation is: $\sqrt{37}$.

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/watch?v=goFvYjGYU18&t=1222s

Answer: $\sqrt{37} \approx 6.083$

1. Find $\sqrt{49}$.

Answer: 7

2. Find $\sqrt{625}$.

Answer: 25

3. Find $\sqrt{\frac{4}{25}}$.

Answer: $\frac{2}{5}$

4. Find $\sqrt{\frac{144}{169}}$.

Answer: $\frac{12}{13}$

5. Approximate $\sqrt{11}$ to the nearest thousandth.

Answer: 3.317

6. Approximate $\sqrt{27}$ to the nearest thousandth.

Answer: 5.196

7. Find $\sqrt{400}$.

Answer: 20

8. Find $\sqrt{\frac{225}{256}}$.

Answer: $\frac{15}{16}$

Module 3G Pythagorean Theorem

Use $a^2 + b^2 = c^2$ to find missing legs and hypotenuses in right triangles. Round to the nearest tenth when directed.

IN PLAIN TERMS

This topic finds missing sides in right triangles by connecting the two legs and the hypotenuse.

KEY PARTS

- The Pythagorean Theorem works only for right triangles.
- The longest side is the hypotenuse.
- You can solve for a missing leg or a missing hypotenuse.

RULES AND FORMULAS

- Use $a^2 + b^2 = c^2$.
- Square the legs first, then add or subtract as needed.
- Take the square root at the end and round only if asked.

LOOK FOR: which side is the hypotenuse and whether you should add squares or subtract one from the other.

VIDEO EXAMPLE

Which set of side lengths cannot be the side lengths of a right triangle?
A. 5 cm, 12 cm, 13 cm
B. 8 in, 17 in, 15 in
C. 35 ft, 12 ft, 37 ft
D. 53 m, 45 m, 26 m

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/0E6MS3d1mes

Answer: D. $53\text{ m}, 45\text{ m}, 26\text{ m}$

VIDEO EXAMPLE

Which set of side lengths does not satisfy the Pythagorean Theorem?
A. 63 cm, 65 cm, 16 cm
B. 72 cm, 30 cm, 79 cm
C. 58 cm, 40 cm, 42 cm
D. 74 cm, 70 cm, 24 cm

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/ziUtaK6REhQ

Answer: B. $72\text{ cm}, 30\text{ cm}, 79\text{ cm}$

VIDEO EXAMPLE

A right triangle has a hypotenuse of 29 cm and one leg of 20 cm. What is the length of the missing leg?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/watch?v=goFvYjGYU18&t=1349s

Answer: 21 cm

1. A right triangle has legs 8 and 15. Find the hypotenuse.

Answer: 17

2. A right triangle has hypotenuse 13 and one leg 5. Find the other leg.

Answer: 12

3. A right triangle has legs 7 and 24. Find the hypotenuse.

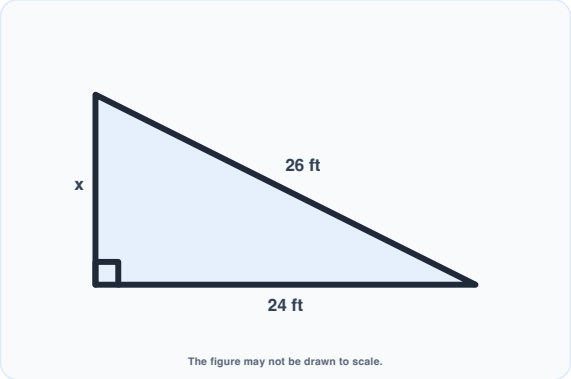
Answer: 25

4. A right triangle has hypotenuse 29 and one leg 20. Find the other leg.

Answer: 21

5. Use the right triangle shown to find the missing side.

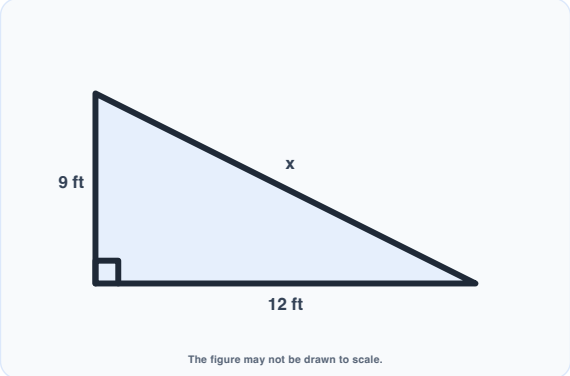
A right triangle is shown with one leg labeled x, the other leg labeled 24 feet, and the hypotenuse labeled 26 feet.



Answer: 10

6. Use the right triangle shown to find the missing side.

A right triangle is shown with legs labeled 9 feet and 12 feet and the hypotenuse labeled x.



Answer: 15

7. A right triangle has legs 13 and 17. Find the hypotenuse. Round to the nearest tenth.

Answer: 21.4

8. A right triangle has hypotenuse 20 and one leg 13. Find the other leg. Round to the nearest tenth.

Answer: 15.2

Module 3H Tree Diagrams

Tree diagrams help you list outcomes in an organized way so you can count possibilities without missing any.

IN PLAIN TERMS

Tree diagrams are a way to organize choices so you can count all possible outcomes clearly.

KEY PARTS

- Tree diagrams help list outcomes in an organized path.
- Each branch stands for one choice or event.
- Total outcomes come from following every path.

RULES AND FORMULAS

- Multiply branch counts when stages happen together.
- List each stage in order.
- Check that no outcomes were skipped or counted twice.

LOOK FOR: how many stages there are and how many branches come from each stage.

1. A spinner has sections A, B, and C. If it is spun once, how many possible outcomes are there?

Answer: 3

2. A spinner has numbers 1, 2, and 3. If it is spun twice, how many possible outcomes are there?

Answer: 9

3. Spinner A has colors red, blue, and yellow. Spinner B has numbers 1, 2, 3, and 4. If both are spun once, how many possible outcomes are there?

Answer: 12

4. If you toss one coin and spin a spinner with numbers 1 through 4 once, how many possible outcomes are there?

Answer: 8

5. A snack shop lets you choose 3 sandwich types and 2 drink types. How many lunch combinations are possible?

Answer: 6

6. A game lets you choose 2 characters, 3 tools, and 2 maps. How many total outcomes are possible?

Answer: 12

Module 3I Probability

Probability is about how likely something is by comparing favorable outcomes to all possible outcomes.

IN PLAIN TERMS

This topic measures how likely something is by comparing the outcomes you want with all the outcomes you could get.

KEY PARTS

- Probability compares favorable outcomes to all outcomes.
- The total number of possible results is the denominator.
- Sometimes a question asks for the probability of not happening.

RULES AND FORMULAS

- Probability = favorable outcomes divided by total outcomes.
- An impossible event has probability 0, and a certain event has probability 1.
- For "not" questions, subtract the unwanted outcomes from the total.

LOOK FOR: the total number of outcomes and exactly which outcomes count as favorable.

VIDEO EXAMPLE

What is probability?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/watch?v=5C9C-rbTQ1g&t=91s

Answer: **Watch the video.** 👍

VIDEO EXAMPLE

If you roll a fair six-sided die once, what is the probability of rolling a 5? Round to the nearest percent.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/5C9C-rbTQ1g?si=o84snjlvBtv19bCe&t=252

Answer: **17%**

VIDEO EXAMPLE

Jackie has 5 quarters, 10 nickels, 9 pennies, and 1 dime in her purse. If she draws one coin at random, what is the probability that it is a nickel?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/5C9C-rbTQ1g?si=wVOsTPjWWil2vSb8&t=428

Answer: $\frac{2}{5} = 0.4 = 40\%$

VIDEO EXAMPLE

A survey asked people for their favorite ice cream flavor. What is the probability that one person chosen from the table picked either vanilla or chocolate? Round to the nearest percent if needed.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/5C9C-rbTQ1g?si=tDq0ffabaiTTXz4f&t=553

Group	Vanilla	Chocolate	Strawberry
Male	10	15	15
Female	25	35	20

Answer: $\frac{17}{24} \approx 71\%$

1. If a single 8-sided die is tossed once, find the probability of rolling a 1.

Answer: $\frac{1}{8}$

2. If a single 12-sided die is tossed once, find the probability of rolling a 3, 9, or 12.

Answer: $\frac{1}{4}$

3. If a single 6-sided die is tossed once, find the probability of rolling an even number.

Answer: $\frac{1}{2}$

4. If a single 4-sided die is tossed once, find the probability of rolling a number less than 3.

Answer: $\frac{1}{2}$

The figure shows nine marbles arranged in rows: two yellow, three blue, two red, and two green.

5. If one marble is chosen from the group shown, what is the probability of choosing a yellow marble?

Answer: $\frac{2}{9}$

6. If one marble is chosen from the group shown, what is the probability of not choosing a blue marble?

Answer: $\frac{2}{3}$

Module 3J-K Measures of Central Tendency

This topic is about reading a data set and deciding what the average or middle really looks like.

IN PLAIN TERMS

This topic summarizes a data set by looking at its average, middle, most common value, and overall spread.

KEY PARTS

- These measures describe the center and spread of data.
- Some data sets are listed directly and some are shown in frequency tables.
- Different measures can tell different stories about the same data.

RULES AND FORMULAS

- Mean = sum of values divided by number of values.
- Median is the middle of the ordered data set.
- Midrange = greatest value plus least value, then divide by 2.

LOOK FOR: whether the data must be ordered first and whether a frequency table needs to be expanded mentally before calculating.

VIDEO EXAMPLE

Find the mean, median, mode, and range for 74, 81, 92, 68, 66, 97, 81, 74.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/P-rYFf_91xc?si=5iS1q66ECeEAw_Fd&t=65

Answer: **Mean = 79.125, median = 77.5, mode = 74 and 81, range = 31**

1. Find the mean, median, mode, range, and midrange of 12, 18, 14, 16, 12, 20, 13.

Answer: **Mean = 15, median = 14, mode = 12, range = 8, midrange = 16**

2. Find the mean, median, mode, range, and midrange of 22, 16, 19, 18, 24, 17.

Answer: **Mean = 19.3, median = 18.5, there is no mode, range = 8, midrange = 20**

Data Item	Frequency
4	2
5	3
6	4
7	1

3. Use the frequency table above to find the mean, median, mode, range, and midrange.

Answer: **Mean = 5.4, median = 5.5, mode = 6, range = 3, midrange = 5.5**

Data Item	Frequency
10	2
11	3
12	2
13	3
14	2

4. Use the frequency table above to find the mean, median, mode, range, and midrange.

Answer: Mean = 12, median = 12, modes = 11 and 13, range = 4, midrange = 12

Module 4: Geometry and Measurement

Module 4 covers geometry and measurement skills including angle relationships, perimeter, circumference, area, volume and surface area, unit conversions, and temperature conversions.

Module 4A Lines, Rays, Segments, and Angles

Start with the basic pieces of geometry and how to name them correctly.

IN PLAIN TERMS

This topic is about telling basic geometry figures apart and naming them the right way.

KEY PARTS

- Geometry starts with recognizing basic figures.
- Lines, rays, segments, and angles are named differently.
- The points shown on a figure help tell you its name.

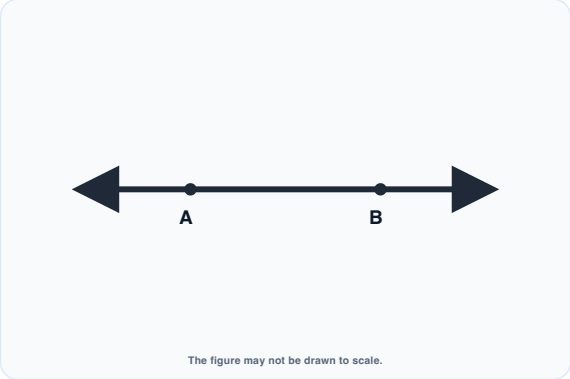
RULES AND FORMULAS

- A line extends forever in both directions.
- A ray has one endpoint and goes on forever in one direction.
- A line segment has two endpoints.

LOOK FOR: the endpoints, arrow marks, and which point should appear in the name.

1. Identify the figure as a line, ray, line segment, or angle, and name it.

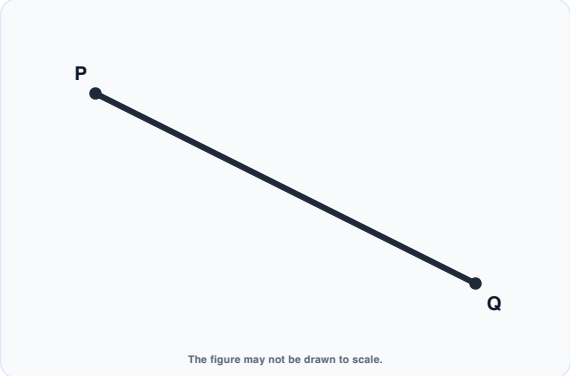
A straight line passes through points A and B and has arrowheads on both ends to show it extends in both directions.



Answer: It is a line named $\overleftrightarrow{AB}$.

2. Identify the figure as a line, ray, line segment, or angle, and name it.

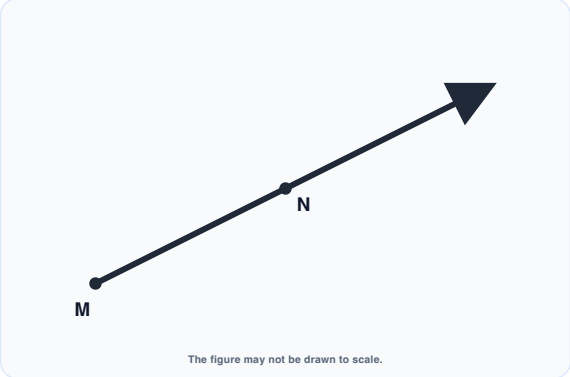
A line segment connects point P to point Q and stops at those two endpoints.



Answer: It is a line segment named $\overline{PQ}$.

3. Identify the figure as a line, ray, line segment, or angle, and name it.

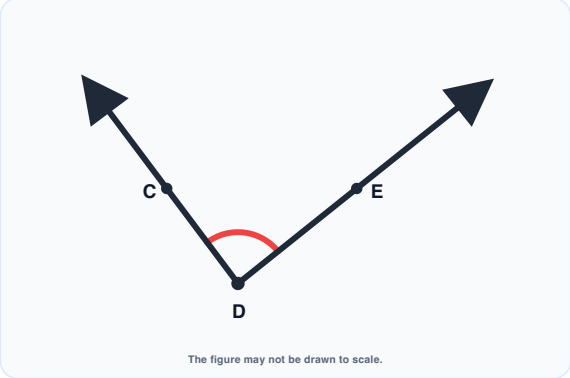
A ray begins at point M, passes through point N, and continues in one direction as shown by the arrowhead.



Answer: It is a ray named $\overrightarrow{MN}$.

4. Identify the figure as a line, ray, line segment, or angle, and give one correct name.

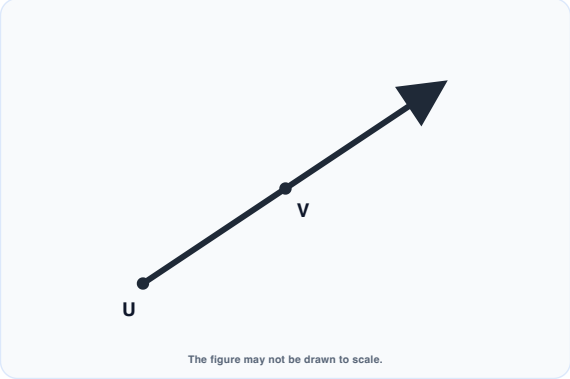
Two rays meet at point D to form an angle. Point C lies on one ray and point E lies on the other ray.



Answer: It is an angle, such as $\angle CDE$ or $\angle EDC$.

5. What is the endpoint of the ray?

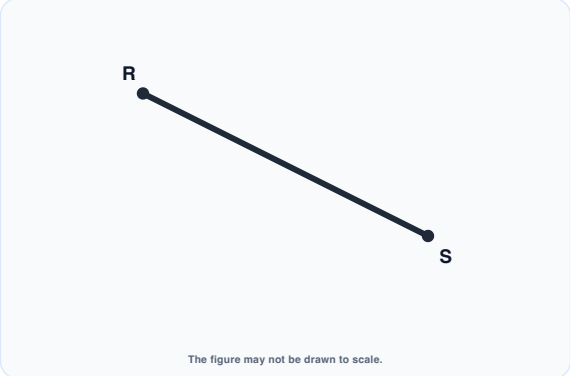
A ray begins at point U, passes through point V, and continues in one direction as shown by the arrowhead.



Answer: The endpoint is U.

6. How many endpoints does the figure have?

A line segment connects point R to point S and stops at those two endpoints.



Answer: It has 2 endpoints.

Module 4B Classifying Angles

Here you sort angles by size and get comfortable telling acute, right, obtuse, and straight apart.

IN PLAIN TERMS

This topic sorts angles by how open they are.

KEY PARTS

- Angles are classified by their size.
- Acute, right, obtuse, and straight are the main types here.
- A picture does not have to be perfectly to scale to be classified.

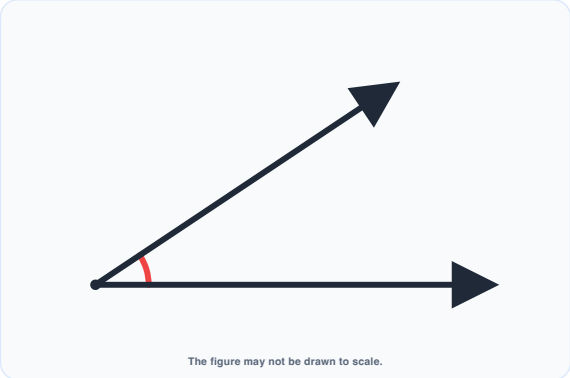
RULES AND FORMULAS

- Acute is less than 90°.
- Right is exactly 90°.
- Obtuse is between 90° and 180°, and straight is 180°.

LOOK FOR: whether the angle is smaller than a right angle, equal to it, larger than it, or flat.

1. Classify the angle as acute, right, obtuse, or straight.

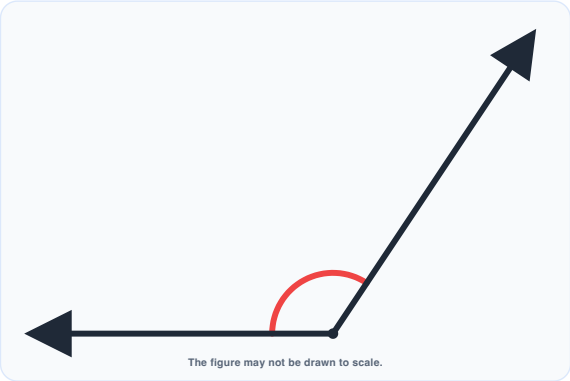
Two rays form an angle smaller than a right angle, with the opening marked by a short arc.



Answer: Acute

2. Classify the angle as acute, right, obtuse, or straight.

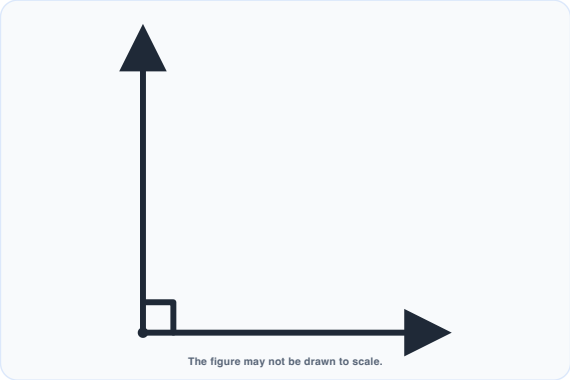
Two rays form an angle larger than a right angle but smaller than a straight angle, with the opening marked by a short arc.



Answer: Obtuse

3. Classify the angle as acute, right, obtuse, or straight.

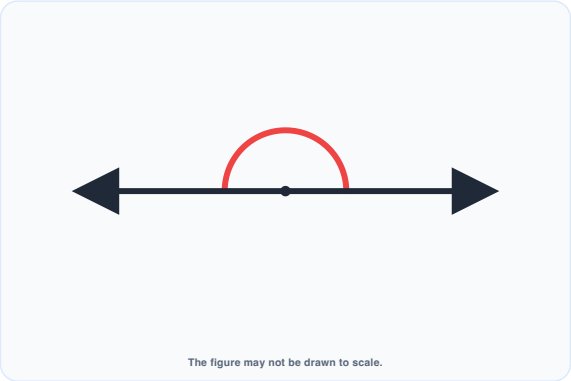
One vertical ray and one horizontal ray meet to form a 90 degree angle marked with a square corner symbol.



Answer: Right

4. Classify the angle as acute, right, obtuse, or straight.

A straight line with arrows on both ends is marked with a semicircular arc to show a 180 degree straight angle.



The figure may not be drawn to scale.

Answer: Straight

Module 4C Finding Angle Measures

Use what you know about nearby angles to fill in missing angle measures.

IN PLAIN TERMS

This topic finds missing angle measures by using what the nearby angles add up to.

KEY PARTS

- Angles can be split into smaller angles.
- Nearby angle facts help you fill in missing measures.
- Pictures often show the total angle and one or more parts.

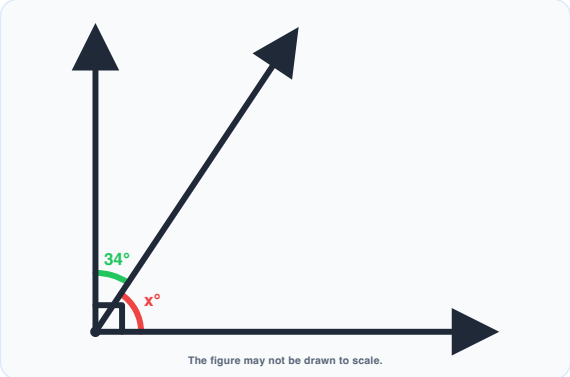
RULES AND FORMULAS

- Use addition when smaller angles make one larger angle.
- Use subtraction when the total angle is known and one part is known.
- Right angles total 90°, and straight angles total 180°.

LOOK FOR: the total angle first, then whether you should add parts together or subtract a known part from the whole.

1. Find the value of angle x.

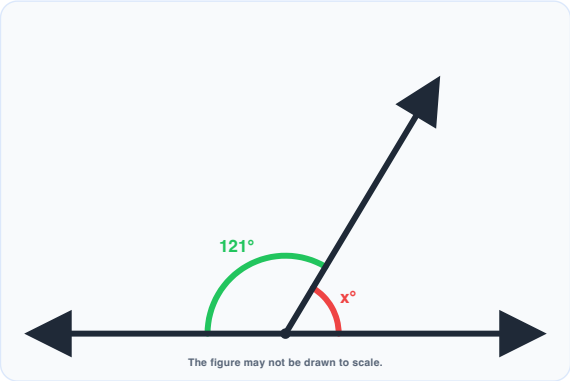
A right angle with one vertical ray and one horizontal ray is split by a third ray into two adjacent angles labeled 34 degrees and x degrees.



Answer: 56°

2. Find the value of angle x.

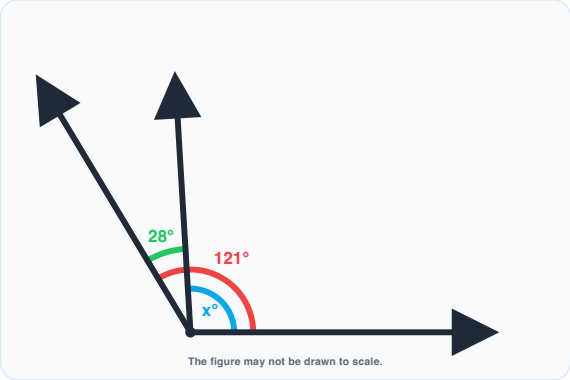
A straight angle on a horizontal line is split by one slanted ray into two adjacent angles labeled 121 degrees and x degrees.



Answer: 59°

3. Find the value of angle x.

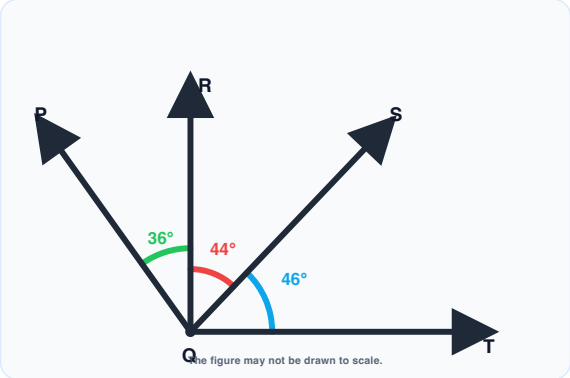
Three rays form a larger angle labeled 121 degrees. One smaller part is labeled 28 degrees, and the remaining adjacent part is labeled x degrees.



Answer: 93°

Use this figure to answer questions 4 through 6.

Four rays extend from point Q toward points P, R, S, and T from left to right. The adjacent angles between the rays are labeled 36 degrees, 44 degrees, and 46 degrees.



4. Find the measure of $\angle PQS$.

Answer: 80°

5. Find the measure of $\angle RQT$.

Answer: 90°

6. Find the measure of $\angle PQT$.

Answer: 126°

Module 4D Complementary, Supplementary, and Vertical Angles

Complementary angles add to 90 degrees, supplementary angles add to 180 degrees, and vertical angles are opposite angles formed by two intersecting lines. In this topic, you find missing angle measures using these relationships.

IN PLAIN TERMS

This topic uses angle relationships to find missing angle measures without measuring them directly.

KEY PARTS

- Complementary angles make a right angle together.
- Supplementary angles make a straight angle together.
- Vertical angles are opposite each other when two lines cross.

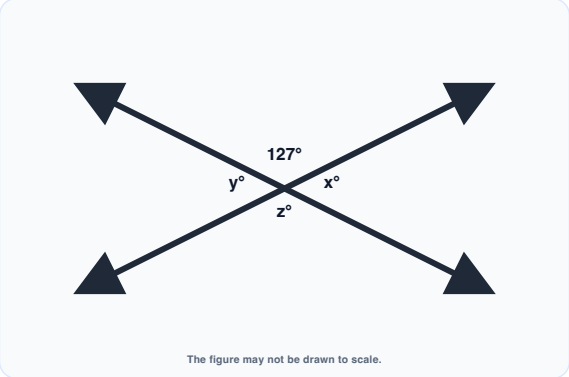
RULES AND FORMULAS

- Complementary angles add to 90°.
- Supplementary angles add to 180°.
- Vertical angles are equal.

LOOK FOR: whether the pair adds to 90°, adds to 180°, or sits across from each other.

1. Find the measures of x, y, and z.

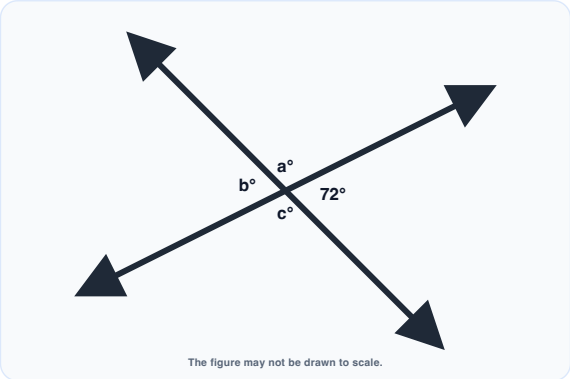
Two diagonal lines cross to form four angles. The top angle is labeled 127 degrees, the right angle is labeled x degrees, the left angle is labeled y degrees, and the bottom angle is labeled z degrees.



Answer: $x = 53^\circ$, $y = 53^\circ$, and $z = 127^\circ$.

2. Find the measures of a, b, and c.

Two diagonal lines cross to form four angles. The right angle is labeled 72 degrees, while the top, left, and bottom angles are labeled a degrees, b degrees, and c degrees.



Answer: $a = 108^\circ$, $b = 72^\circ$, and $c = 108^\circ$.

3. Find the measure of the complement of a 9° angle.

Answer: 81°

4. Find the measure of the supplement of a 40° angle.

Answer: 140°

5. Find the measure of the complement of a 48° angle.

Answer: 42°

6. Find the measure of the supplement of a 105° angle.

Answer: 75°

7. The angle between two walls is 113.4°. Find the supplement of this angle.

Answer: 66.6°

Module 4E Perimeter of Polygons

Perimeter is just the distance around a shape, whether the figure is simple or made of several parts.

IN PLAIN TERMS

This topic finds how far it is to go all the way around different polygon shapes.

KEY PARTS

- Perimeter means distance around a polygon.
- Every outside side length must be counted once.
- Composite shapes may require finding missing edges first.

RULES AND FORMULAS

- Add all outside side lengths.
- Keep the units in the final answer.
- For regular polygons, multiply one side by the number of sides.

LOOK FOR: every outside edge and any missing side length you may need before adding.

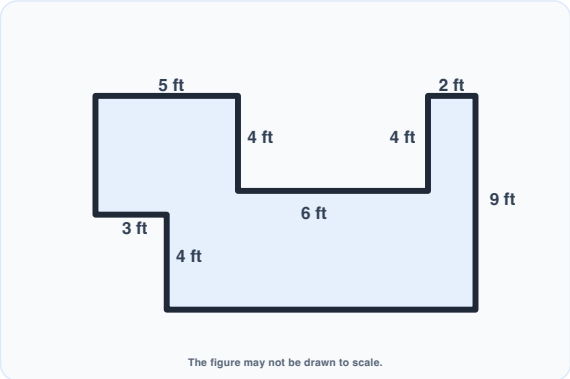
VIDEO EXAMPLE

Find the perimeter of the shape shown. Assume every angle is a right angle.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/3Eg1-EuCF18?si=MgfusXqeu1PL3-yL&t=10

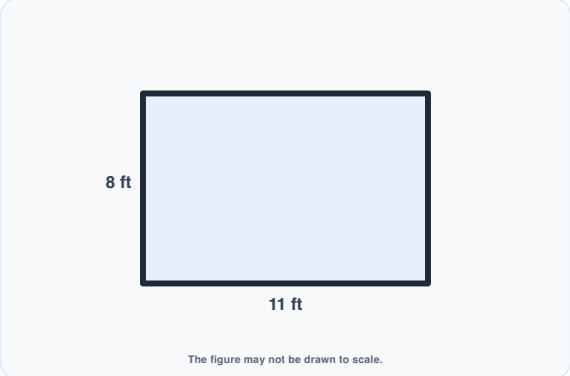
The figure is a rectilinear polygon with a top-left horizontal side of 5 feet, a top-right horizontal side of 2 feet, two inner vertical drops of 4 feet, a middle horizontal section of 6 feet, a right outside height of 9 feet, a left inner horizontal section of 3 feet, and a lower left vertical section of 4 feet.



Answer: 52 ft

1. Find the perimeter of the rectangle.

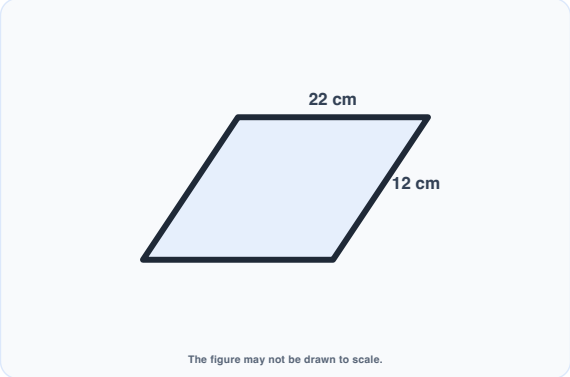
A rectangle is shown with one side labeled 8 feet and an adjacent side labeled 11 feet.



Answer: 38 ft

2. Find the perimeter of the parallelogram.

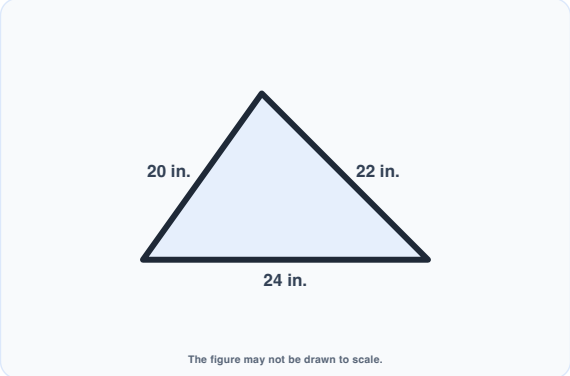
A parallelogram is shown with one side labeled 22 centimeters and one adjacent side labeled 12 centimeters.



Answer: 68 cm

3. Find the perimeter of the triangle.

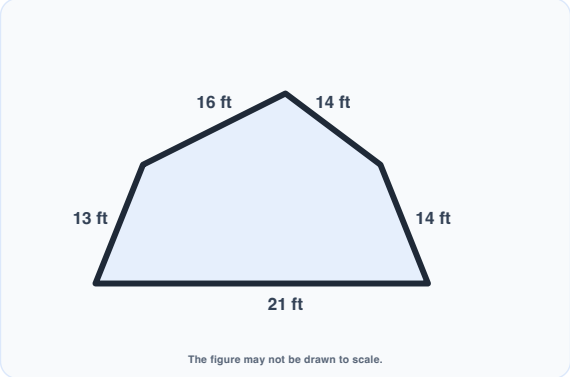
A triangle is shown with its three side lengths labeled 20 inches, 22 inches, and 24 inches.



Answer: 66 in.

4. Find the perimeter of the polygon.

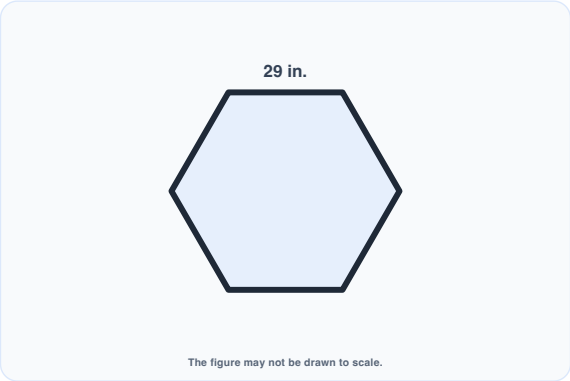
A five-sided polygon is shown with side lengths labeled 13 feet, 16 feet, 14 feet, 14 feet, and 21 feet around the outside.



Answer: 78 ft

5. Find the perimeter of the regular hexagon.

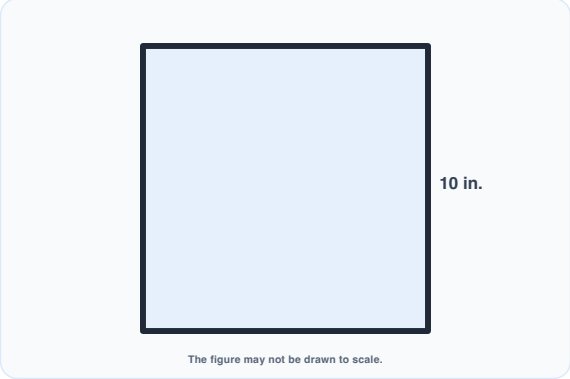
A regular hexagon is shown with one side labeled 29 inches, which means all six sides are the same length.



Answer: 174 in.

6. Find the perimeter of the regular square.

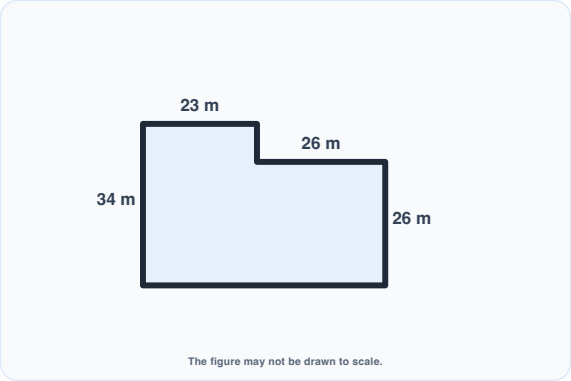
A square is shown with one side labeled 10 inches, which means all four sides are 10 inches long.



Answer: 40 in.

7. Find the perimeter of the composite figure. Assume all angles are right angles.

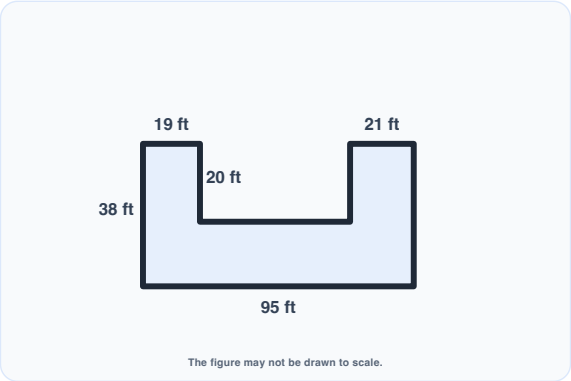
The figure is a step-shaped polygon. Starting at the bottom left, it rises 34 meters, moves right 23 meters, drops to a lower ledge, continues right 26 meters, then drops 26 meters to the bottom before closing along the base.



Answer: 166 m

8. Find the perimeter of the composite figure. Assume all angles are right angles.

The figure is an outer rectangle-like shape with a rectangular notch cut out of the top center. The left top section is 19 feet wide, the right top section is 21 feet wide, the notch depth is 20 feet, the outside height is 38 feet, and the full bottom width is 95 feet.



Answer: 306 ft

Module 4F Circumference

Use diameter or radius to find the exact circumference in terms of π, then approximate with $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

IN PLAIN TERMS

This topic finds the distance around a circle using either its diameter or radius.

KEY PARTS

- Circumference is the distance around a circle.
- You can use radius or diameter to find it.
- Some answers stay in terms of π, and some are approximated.

RULES AND FORMULAS

- $C = \pi d$.
- $C = 2\pi r$.
- Use the value of π the problem asks for when approximating.

LOOK FOR: whether the given measure is a radius or diameter and whether the answer should stay exact or be approximated.

VIDEO EXAMPLE

What are the formulas for the circumference and area of a circle?

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/5_RhImKtXK8

Answer: **Circumference: $C = \pi d$ or $C = 2\pi r$. Area: $A = \pi r^2$. Watch the video for a clever way to remember.**

VIDEO EXAMPLE

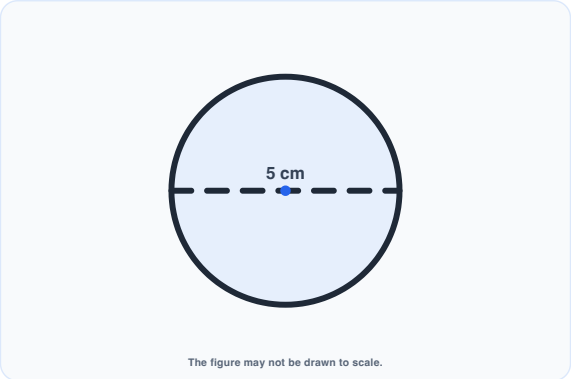
A circular table has an area of 64π square meters. What is its circumference? Leave the answer in terms of π.

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/MmNISc2ntW0

Answer: 16π **m**

1. Find the circumference of the circle. Give the exact circumference, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

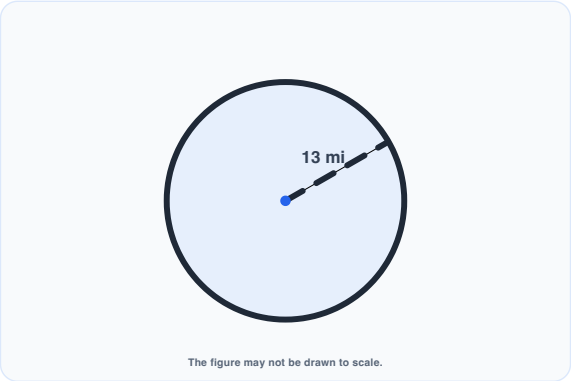
A circle is shown with a dashed line running across the full width through the center to mark a diameter of 5 centimeters.



Answer: Exact circumference: 5π cm; approximate circumference using 3.14: 15.70 cm; approximate circumference using $\frac{22}{7}$: $15\frac{5}{7}$ cm

2. Find the circumference of the circle. Give the exact circumference, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

A circle is shown with a dashed segment from the center to the edge to mark a radius of 13 miles.



Answer: Exact circumference: 26π mi; approximate circumference using 3.14: 81.64 mi; approximate circumference using $\frac{22}{7}$: $81\frac{5}{7}$ mi

Module 4G Perimeter Applications

This topic uses perimeter and circumference in everyday situations like fencing, borders, and distances around objects.

IN PLAIN TERMS

This topic uses perimeter and circumference to solve practical questions about going around real objects.

KEY PARTS

- Perimeter and circumference show up in real situations like borders and fencing.
- Some questions also attach a cost per foot.
- You often solve the geometry part first, then the application part.

RULES AND FORMULAS

- Find the distance around the shape before applying any rate.
- Multiply by the cost per unit only after the perimeter is known.
- Use the stated approximation for π when needed.

LOOK FOR: whether the question wants just the distance around or the cost based on that distance.

VIDEO EXAMPLE

A patio is 18 feet by 30 feet. You want a one-paver border around it using square pavers that are 9 inches by 9 inches. If each paver costs $3.50, how much will the border cost?

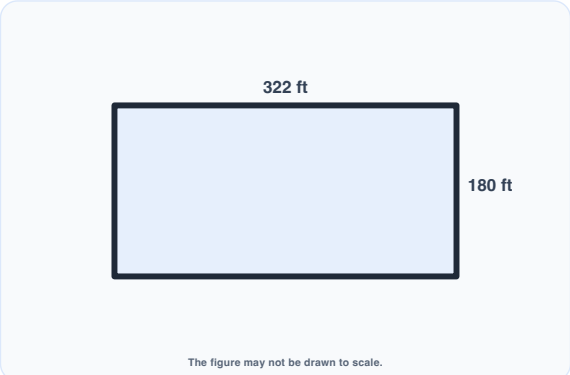
SCAN FOR VIDEO WALKTHROUGH

youtu.be/H7CWlvvX6-o?si=KXc2WPWIm_5RpP2B&t=15

Answer: 132 pavers, so the total cost is $462.

1. A rectangular playing field measures 322 feet by 180 feet. If a line-marking machine lays down lime powder all the way around the field, how many feet of lime powder will be deposited?

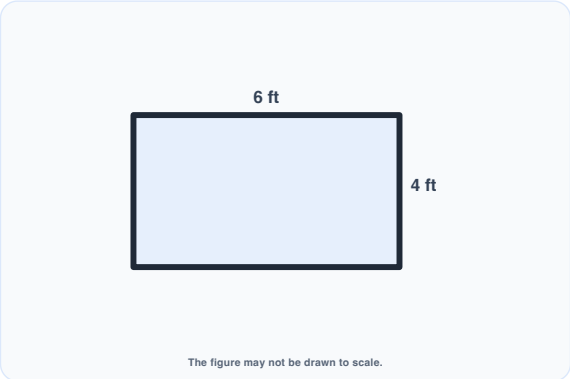
A rectangle representing a playing field is labeled 322 feet along one side and 180 feet along the adjacent side.



Answer: 1,004 feet

2. A metal strip is being installed around a workbench that is 6 feet long and 4 feet wide. If the stripping costs $5 per foot, find the total cost of the stripping.

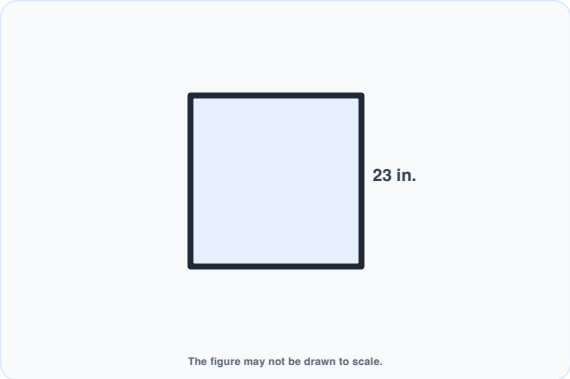
A rectangle representing a workbench is labeled 6 feet on one side and 4 feet on the adjacent side.



Answer: $100

3. Find the perimeter of the top of a square compact case if the length of one side is 23 inches.

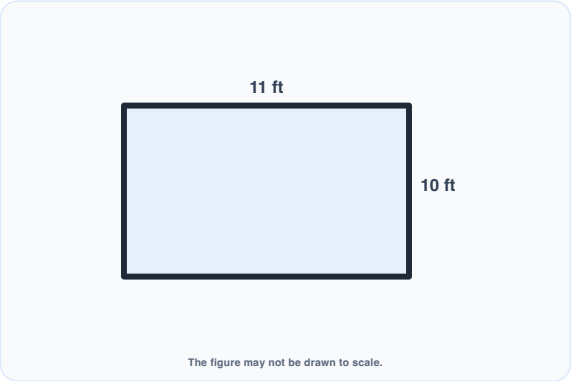
A square representing a compact case is shown with one side labeled 23 inches.



Answer: 92 inches

4. A rectangular room measures 10 feet by 11 feet. Find the cost of installing a strip of wallpaper around the room if the wallpaper costs $0.90 per foot.

A rectangle representing a room is labeled 11 feet on one side and 10 feet on the adjacent side.



Answer: $37.80

5. A circular trampoline has a diameter of 13 feet. Using $\pi \approx 3.14$, how many feet of netting are needed to go around the outside of the trampoline?

Answer: 40.82 feet

Module 4H Area

Area measures how much flat space is inside a shape.

IN PLAIN TERMS

This topic finds how much flat space is covered inside a shape.

KEY PARTS

- Area measures the space inside a figure.
- Different shapes use different formulas.
- Composite figures may need to be split into smaller parts.

RULES AND FORMULAS

- Rectangle area = length times width.
- Triangle area = $\frac{1}{2}bh$.
- Circle area = πr^2.

LOOK FOR: which formula fits the figure and whether the shape should be split into simpler pieces first.

VIDEO EXAMPLE

A circular horse corral has a perimeter of 64π meters. What is the area of the corral? Leave the answer in terms of π.

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/SlHK3eptd0o

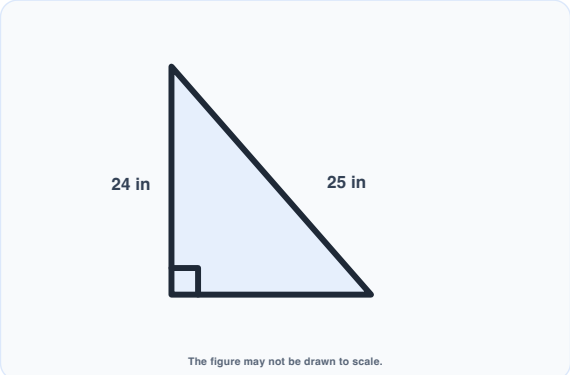
Answer: 1024π m²

VIDEO EXAMPLE

Find the area of the right triangle.

SCAN FOR VIDEO WALKTHROUGH
www.youtube.com/shorts/miJD7HTYXQ8

A right triangle is shown with a vertical leg labeled 24 inches and a slanted hypotenuse labeled 25 inches. The bottom-left corner is marked as a right angle.



Answer: 84 sq in

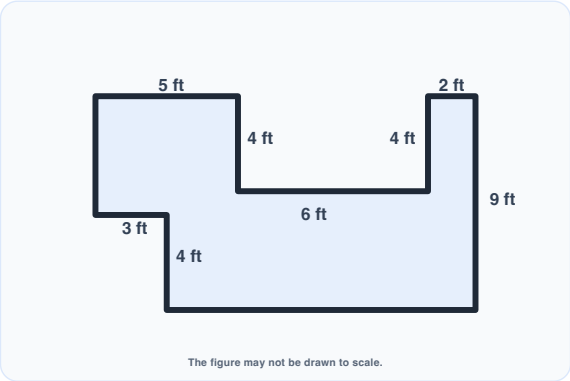
VIDEO EXAMPLE

Find the area of the complex figure. Assume every angle shown is a right angle.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/97hiLyNF5Mw?si=yp7eYK0acP2L1lhM&t=8

The figure is a rectilinear polygon with a top-left horizontal side of 5 feet, a top-right horizontal side of 2 feet, two inner vertical drops of 4 feet, a middle horizontal section of 6 feet, a right outside height of 9 feet, a left inner horizontal section of 3 feet, and a lower left vertical section of 4 feet.



Answer: 81 sq ft

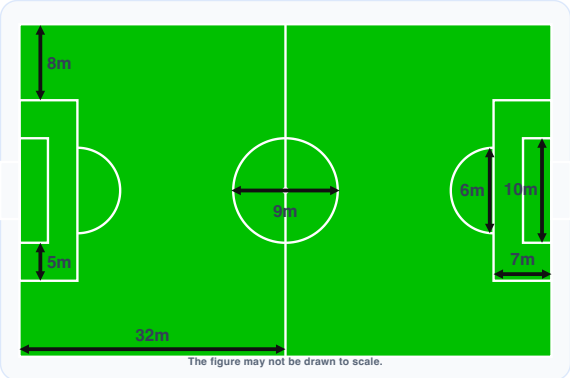
VIDEO EXAMPLE

Find the area of the soccer field.

SCAN FOR VIDEO WALKTHROUGH

www.youtube.com/shorts/dySb4-G4UG8

A symmetric soccer field is shown on the standard 600 by 400 canvas with mirrored boxes on both ends. The visible labels match the reference image: 8 meters at the upper left, 5 meters on the lower left box segment, 9 meters across the center circle, 6 meters on the right arc span, 10 meters on the right goal box, 7 meters across the right box width, and 32 meters from the left side to midfield.



Answer: 2,304 sq m

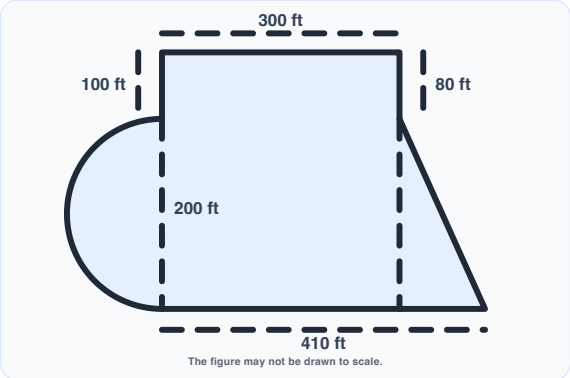
VIDEO EXAMPLE

Find the area of the composite figure.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/TJNAX8vDYZQ?si=WZTB24dupuZ4LdAp&t=8

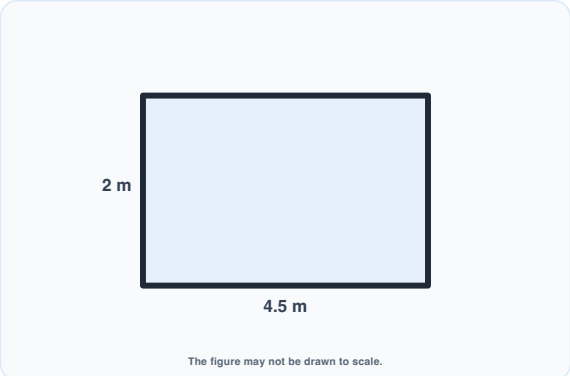
A composite figure is shown with a semicircle attached to the left side of a larger polygon. Dashed helper lines mark the 200 foot semicircle diameter, the full 300 foot top width, the 100 foot upper left segment, the 80 foot upper right segment, and the 410 foot bottom width. A dashed vertical line near the right side shows where the polygon can be split into a rectangle and a right triangle.



Answer: 117,800 sq ft

1. Find the area of the rectangle.

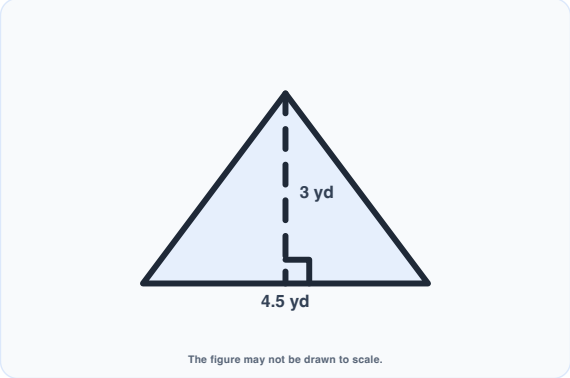
A rectangle is shown with one side labeled 2 meters and the adjacent side labeled 4.5 meters.



Answer: 9 sq m

2. Find the area of the triangle.

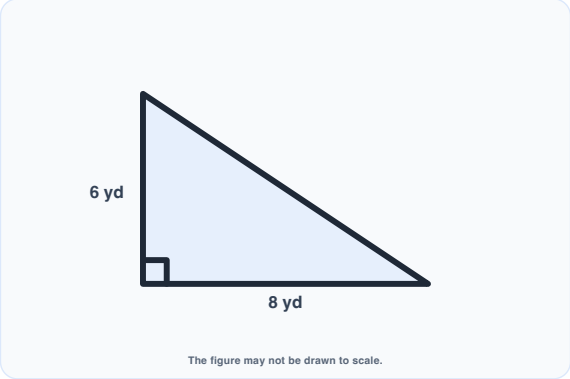
A triangle is shown with a base labeled 4.5 yards and a dashed height labeled 3 yards.



Answer: 6.75 sq yd

3. Find the area of the triangle.

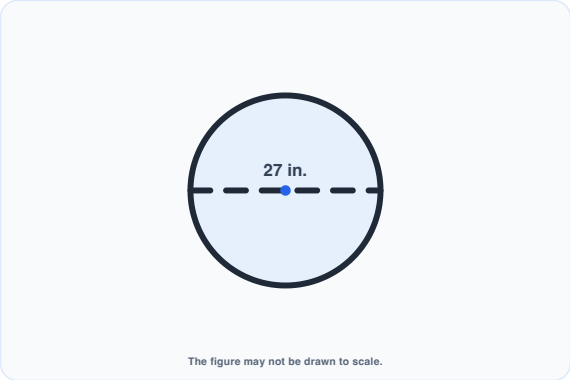
A right triangle is shown with a base labeled 8 yards and a vertical height labeled 6 yards.



Answer: 24 sq yd

4. Find the area of the circle. Give the exact area, then approximate using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

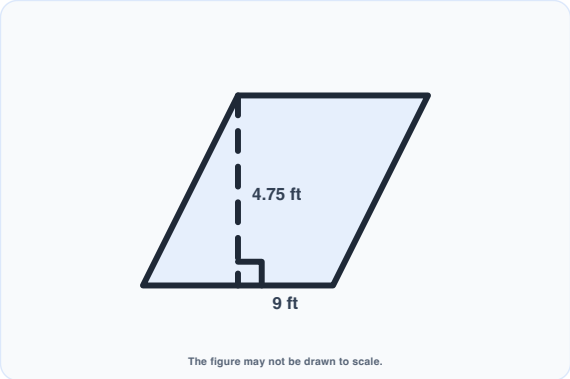
A circle is shown with a dashed segment through the center marking a diameter of 27 inches.



Answer: Exact area: 182.25π sq in; approximate area using 3.14: 572.265 sq in; approximate area using $\frac{22}{7}$: $572\frac{11}{14}$ sq in

5. Find the area of the parallelogram.

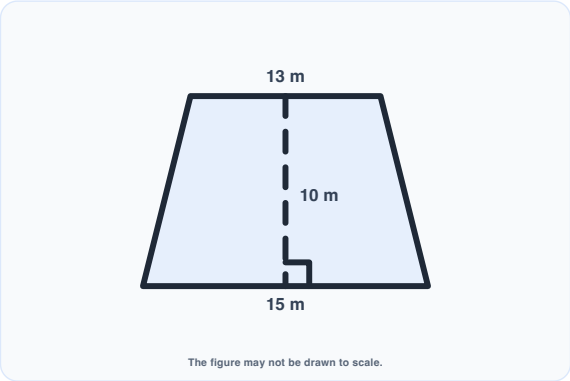
A parallelogram is shown with a base labeled 9 feet and a dashed vertical height labeled 4.75 feet.



Answer: 42.75 sq ft

6. Find the area of the trapezoid.

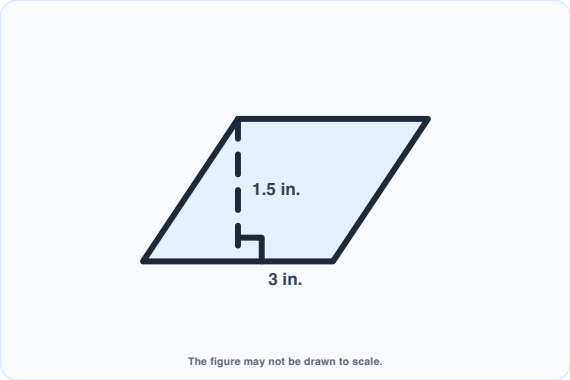
A trapezoid is shown with top and bottom bases labeled 13 meters and 15 meters and a dashed vertical height labeled 10 meters.



Answer: 140 sq m

7. Find the area of the parallelogram.

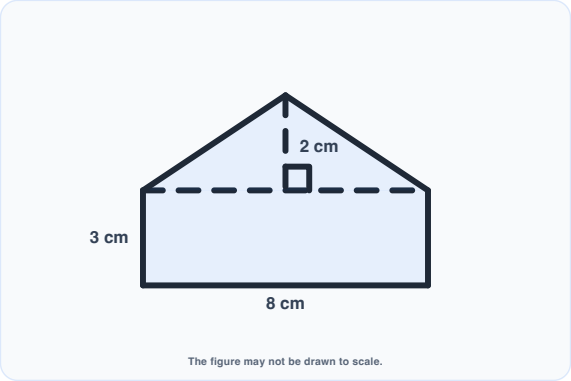
A parallelogram is shown with a base labeled 3 inches and a dashed vertical height labeled 1.5 inches.



Answer: 4.5 sq in

8. Find the area of the composite figure.

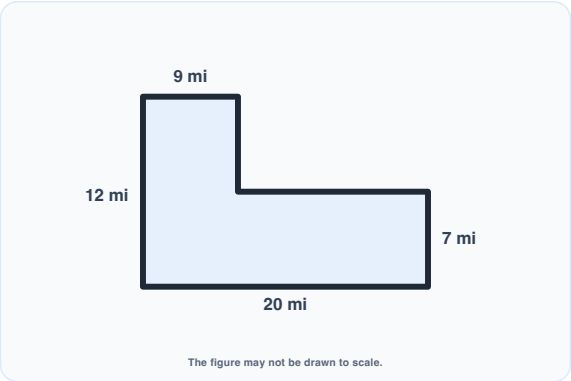
The figure is a rectangle 8 centimeters wide and 3 centimeters tall with an isosceles triangle attached on top. The triangle shares the rectangle's top side as its base and has a height of 2 centimeters.



Answer: 32 sq cm

9. Find the area of the L-shaped figure. Assume all angles are right angles.

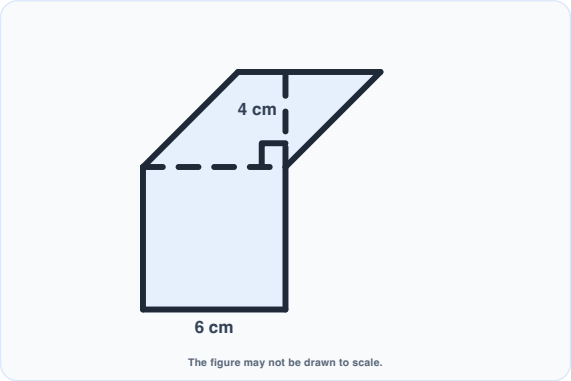
The figure is an L-shaped polygon with a shorter upper-left rectangle cutout. The top horizontal side is labeled 9 miles, the left vertical side is 12 miles, the bottom side is 20 miles, and the right vertical side is 7 miles.



Answer: 185 sq mi

10. Find the area of the composite figure. The lower shape is a square.

The lower part is a square with side length 6 centimeters. A parallelogram sits on top of the square, sharing the square's top edge as its base and using a vertical height of 4 centimeters.



Answer: 60 sq cm

Module 4I Volume and Surface Area of Solids

Find the volume and surface area of prisms, pyramids, cylinders, cones, cubes, and spheres using exact values and approximations with $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$ when π appears.

IN PLAIN TERMS

This topic works with three-dimensional figures by finding how much they hold and how much surface they have on the outside.

KEY PARTS

- Volume measures space inside a solid.
- Surface area measures the total outside covering of a solid.
- Some solids use π, and some do not.

RULES AND FORMULAS

- Volume uses cubic units, and surface area uses square units.
- Use the correct solid formula before substituting numbers.
- When π appears, follow the directions about exact or approximate answers.

LOOK FOR: whether the problem wants inside space or outside covering, and which formula belongs to the solid shown.

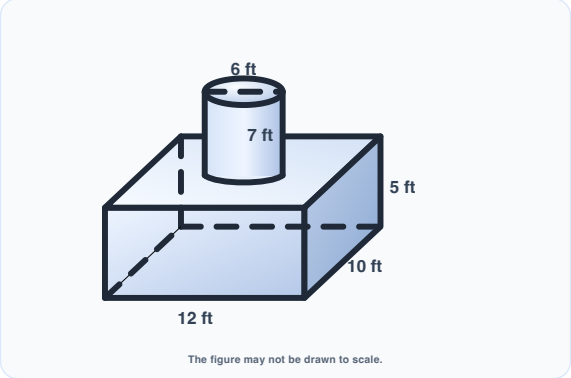
VIDEO EXAMPLE

A mold to create a solid concrete slab is shaped like a rectangular box with a cylinder on top. The box measures 12 ft by 10 ft by 5 ft. The cylinder has a diameter of 6 ft and a height of 7 ft. How many cubic feet of concrete will it take to fill the mold?

SCAN FOR VIDEO WALKTHROUGH

youtu.be/cfbbxrh1sj4?si=B6WXCKGZt9C4xc1-&t=19

A shaded rectangular prism is drawn in perspective to represent a solid slab with a cylinder standing on top of it. The slab measures 12 feet long, 10 feet deep, and 5 feet tall. The cylinder has a diameter of 6 feet and a height of 7 feet.



Answer: 797.82 cubic ft

VIDEO EXAMPLE

A cylinder has a diameter of 12 inches at its base. The height of the cylinder is 1.25 feet. What is the volume of the cylinder in cubic inches? Use 3.14 for π and round your answer to the nearest cubic inch.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/KPf9nW3xXT8?si=wLk2HrLWlsKLRSBr&t=17

Answer: 1,696 cubic in

VIDEO EXAMPLE

Santa's workshop is putting a bicycle in a rectangular box that is 18 inches wide, 4.25 feet long, and 3 feet 9 inches tall. There is no waste of wrapping paper. How many square feet of wrapping paper are needed to wrap the box entirely? Leave the answer in exact decimal form.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/FTJeUPbMfts?si=TbbxRrOdYFhmubSR&t=19

Answer: 55.875 sq ft

VIDEO EXAMPLE

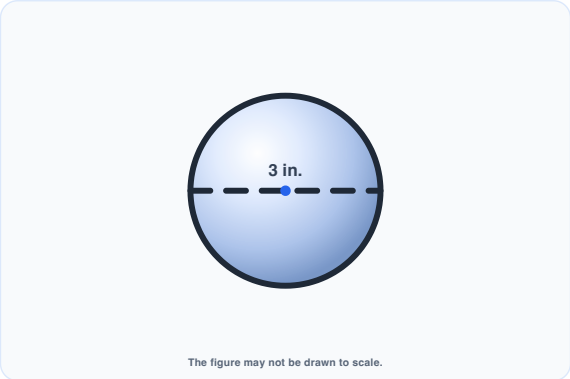
Brett wants to sound proof his studio, which is shaped like a box. He will cover all 4 walls, the floor, and the ceiling with sound proof padding. If the floor is 15 ft by 20 ft and the room is 10 ft tall, how much will Brett spend on padding that costs $2.50 per square foot?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/BkfDWXTyHyY?si=egyaJWkzGdLbOyqb&t=17

Answer: $3,250

1. Find the volume and surface area of the sphere. Give exact answers, then approximate each using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

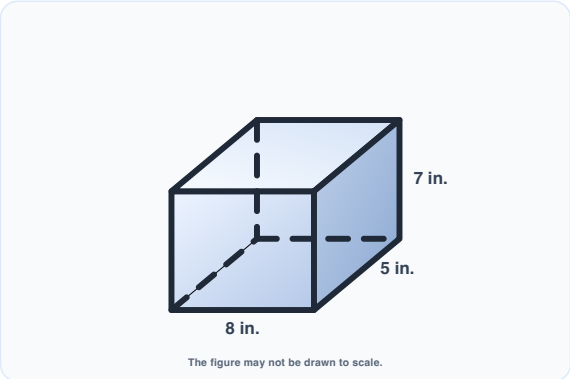
A shaded sphere is shown as a circle with a dashed horizontal diameter passing through the center. The diameter is labeled 3 inches.



Answer: Exact volume: $\frac{9\pi}{2}$ cubic inches; exact surface area: 9π square inches; approximate volume using 3.14: 14.13 cubic inches; approximate surface area using 3.14: 28.26 square inches; approximate volume using $\frac{22}{7}$: $14\frac{1}{7}$ cubic inches; approximate surface area using $\frac{22}{7}$: $28\frac{2}{7}$ square inches

2. Find the volume and surface area of the rectangular prism.

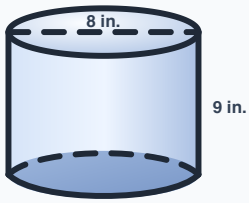
A shaded rectangular prism is drawn in perspective with the front, top, and right faces visible. Dashed segments mark hidden back edges, and the visible dimensions are labeled 8 inches, 7 inches, and 5 inches.



Answer: Volume: 280 cubic inches; surface area: 262 square inches

3. Find the volume and surface area of the cylinder. Give exact answers, then approximate each using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

A shaded cylinder is shown upright with elliptical top and bottom faces. A dashed line across the top marks the diameter of 8 inches, and the side height is labeled 9 inches.

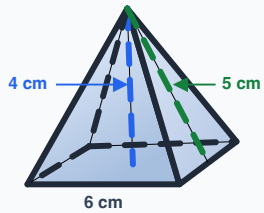


The figure may not be drawn to scale.

Answer: Exact volume: 144π cubic inches; exact surface area: 104π square inches; approximate volume using 3.14: 452.16 cubic inches; approximate surface area using 3.14: 326.56 square inches; approximate volume using $\frac{22}{7}$: $452\frac{4}{7}$ cubic inches; approximate surface area using $\frac{22}{7}$: $326\frac{6}{7}$ square inches

4. Find the volume and surface area of the square pyramid.

A square pyramid is drawn with one triangular face in front and another to the right. The base edge is labeled 6 centimeters, a dashed interior segment shows the vertical height of 4 centimeters, and a dashed slanted segment marks a slant height of 5 centimeters.

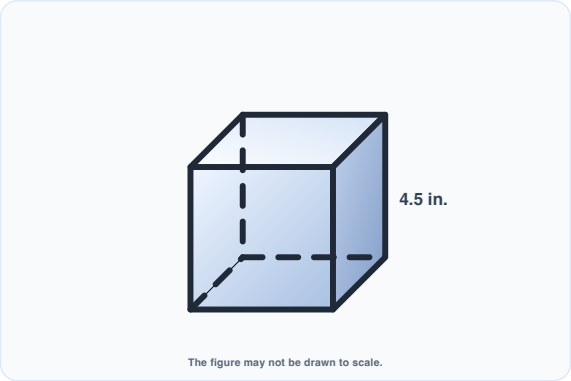


The figure may not be drawn to scale.

Answer: Volume: 48 cubic centimeters; surface area: 96 square centimeters

5. Find the volume and surface area of the cube.

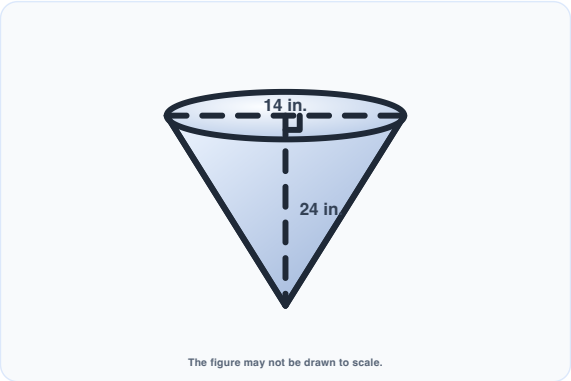
A shaded cube is drawn in perspective with front, top, and right faces visible. Dashed segments mark hidden back edges, and one edge length is labeled 4.5 inches.



Answer: Volume: $91\frac{1}{8}$ cubic inches; surface area: $121\frac{1}{2}$ square inches

6. Find the volume and surface area of the cone. Give exact answers, then approximate each using $\pi \approx 3.14$ and $\pi \approx \frac{22}{7}$.

A shaded cone is shown with an elliptical top base and a pointed tip below. A dashed line across the base marks the diameter of 14 inches, and a dashed vertical segment from the center of the base to the tip marks the height of 24 inches.



Answer: Exact volume: 392π cubic inches; exact surface area: 224π square inches; approximate volume using 3.14: 1230.88 cubic inches; approximate surface area using 3.14: 703.36 square inches; approximate volume using $\frac{22}{7}$: 1232 cubic inches; approximate surface area using $\frac{22}{7}$: 704 square inches

Module 4J US Length Conversions

Switch between common US length units like inches, feet, yards, and miles.

IN PLAIN TERMS

This topic changes U.S. length measurements from one unit to another without changing the actual distance.

KEY PARTS

- Customary length units include inches, feet, yards, and miles.
- Many problems need more than one conversion step.
- The same distance can be named in different units.

RULES AND FORMULAS

- 12 inches = 1 foot.
- 3 feet = 1 yard.
- 5,280 feet = 1 mile.

LOOK FOR: whether you should multiply or divide and whether the conversion takes one step or several.

VIDEO EXAMPLE

If Jack's stride while running is 70 inches, approximately how many times will his feet hit the ground in one mile?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/YJrZk-nQTrs?si=wRtc0jFITQDib0QN&t=55

Answer: about 905 times

1. Convert 96 inches to feet.

Answer: 8 ft

2. Convert 11 yards to feet.

Answer: 33 ft

3. Convert 26,400 feet to miles.

Answer: 5 mi

4. Convert $8\frac{3}{4}$ feet to inches.

Answer: 105 in

5. Convert 24 feet to yards.

Answer: 8 yd

6. Convert 2.5 miles to feet.

Answer: 13,200 ft

7. Convert 540 inches to yards.

Answer: 15 yd

8. Convert 18 inches to feet.

Answer: 1.5 ft

Module 4K Metric Length Conversions

Practice moving between metric length units by knowing how the prefixes relate.

IN PLAIN TERMS

This topic converts metric length units by using the base-10 structure of the metric system.

KEY PARTS

- Metric length uses millimeters, centimeters, meters, and kilometers.
- The metric system is based on powers of 10.
- Converting often means moving the decimal point.

RULES AND FORMULAS

- 10 millimeters = 1 centimeter.
- 100 centimeters = 1 meter.
- 1,000 meters = 1 kilometer.

LOOK FOR: which metric unit is larger, which is smaller, and how many powers of 10 separate them.

VIDEO EXAMPLE

How many hectometers are there in 4357 cm?

SCAN FOR VIDEO WALKTHROUGH

youtu.be/F9z7aQTqCpA?si=Fk6lwckgYm9QFAms&t=220

Answer: 0.4357 hm

1. Convert 4.2 meters to centimeters.

Answer: 420 cm

2. Convert 850 millimeters to centimeters.

Answer: 85 cm

3. Convert 6500 meters to kilometers.

Answer: 6.5 km

4. Convert 2400 millimeters to meters.

Answer: 2.4 m

5. Convert 315 centimeters to meters.

Answer: 3.15 m

6. Convert 0.08 kilometers to centimeters.

Answer: 8,000 cm

7. Convert 12.6 kilometers to meters.

Answer: 12,600 m

8. Convert 14.8 centimeters to millimeters.

Answer: 148 mm

9. Convert 73 millimeters to decimeters.

Answer: 0.73 dm

10. Convert 0.56 meters to millimeters.

Answer: 560 mm

Module 4L US Weight Conversions

Work with ounces, pounds, and tons and get comfortable moving between them.

IN PLAIN TERMS

This topic rewrites customary weight measurements in different units while keeping the same actual weight.

KEY PARTS

- Customary weight units include ounces, pounds, and tons.
- You may convert from small to large units or large to small units.
- The amount stays the same even though the number changes.

RULES AND FORMULAS

- 16 ounces = 1 pound.
- 2,000 pounds = 1 ton.
- Multiply when moving to a smaller unit and divide when moving to a larger unit.

LOOK FOR: whether the target unit is larger or smaller than the starting unit.

VIDEO EXAMPLE

The weight limit for an 18-wheeler is 40 tons, including the truck and cargo. Jack's 18-wheeler weighs 32,000 pounds without cargo. If the average market pig weighs 250 pounds, about how many pigs can Jack carry and stay within the weight regulations? Use $1 \text{ ton} = 2000 \text{ lb}$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/YsXs2kA9DEg?si=sYJkNDRLGOyfHkbl&t=16

Answer: 192 pigs

1. Convert 6 pounds to ounces.

Answer: 96 oz

2. Convert 2.5 tons to pounds.

Answer: 5,000 lb

3. Convert 18,000 pounds to tons.

Answer: 9 tons

4. Convert 88 ounces to pounds.

Answer: $5\frac{1}{2}$ lb

5. Convert 7500 pounds to tons.

Answer: $3\frac{3}{4}$ tons

6. Convert 12.5 pounds to ounces.

Answer: 200 oz

7. Convert 7 tons to pounds.

Answer: 14,000 lb

8. Convert $3\frac{1}{8}$ pounds to ounces.

Answer: 50 oz

9. Convert 9460 pounds to the nearest tenth of a ton.

Answer: 4.7 tons

10. Convert $\frac{3}{4}$ ounce to pounds.

Answer: $\frac{3}{64}$ lb

Module 4M Metric Weight Conversions

This topic covers metric mass units and how they scale up or down.

IN PLAIN TERMS

This topic converts metric weight units by using the place-value pattern built into the metric system.

KEY PARTS

- Metric weight units include milligrams, grams, and kilograms.
- Each step changes by a factor of 1,000 or 100 depending on the units used.
- Metric conversions are usually easier because the pattern is regular.

RULES AND FORMULAS

- 1,000 milligrams = 1 gram.
- 1,000 grams = 1 kilogram.
- Use powers of 10 to move between units.

LOOK FOR: the starting unit, the target unit, and how many places the decimal should move.

VIDEO EXAMPLE

Convert 33.01 kg to g.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/F9z7aQTqCpA?si=7gseRl_TQH_4l7Dl&t=176

Answer: 33,010 g

1. Convert 325 grams to kilograms.

Answer: 0.325 kg

2. Convert 0.8 grams to milligrams.

Answer: 800 mg

3. Convert 6.4 kilograms to grams.

Answer: 6,400 g

4. Convert 275 milligrams to grams.

Answer: 0.275 g

5. Convert 12.3 grams to kilograms.

Answer: 0.0123 kg

6. Convert 7.42 grams to milligrams.

Answer: 7,420 mg

7. Convert 0.68 kilograms to grams.

Answer: 680 g

8. Convert 31 hectograms to centigrams.

Answer: 310,000 cg

Module 4N US Capacity Conversions

Convert between the common US liquid measures you see in recipes and containers.

IN PLAIN TERMS

This topic converts U.S. liquid capacity units so the amount stays the same but the unit changes.

KEY PARTS

- Customary capacity units include cups, pints, quarts, and gallons.
- Capacity measures how much a container can hold.
- Conversion chains may use more than one fact.

RULES AND FORMULAS

- 2 cups = 1 pint.
- 2 pints = 1 quart.
- 4 quarts = 1 gallon.

LOOK FOR: which capacity fact applies first and whether you need to move through more than one unit.

VIDEO EXAMPLE

Do you know about Ms. Gallon?

SCAN FOR VIDEO WALKTHROUGH
youtu.be/NZUEflSR2z4?si=Te_dqKdEN332WOx8&t=8

Answer: Watch video. 👍

1. Convert 32 fluid ounces to cups.

Answer: 4 cups

2. Convert 9 quarts to pints.

Answer: 18 pints

3. Convert 18 quarts to gallons.

Answer: $4\frac{1}{2}$ gallons

4. Convert 80 fluid ounces to pints.

Answer: 5 pints

5. Convert 6 quarts to cups.

Answer: 24 cups

6. Convert 144 fluid ounces to quarts.

Answer: $4\frac{1}{2}$ quarts

7. Convert 22 cups to quarts.

Answer: $5\frac{1}{2}$ quarts

8. Convert $3\frac{1}{2}$ pints to cups.

Answer: 7 cups

9. Convert $1\frac{1}{2}$ cups to pints.

Answer: $\frac{3}{4}$ pint

10. Convert $2\frac{3}{4}$ gallons to pints.

Answer: 22 pints

Module 4O Metric Capacity Conversions

Move between milliliters, liters, and other metric capacity units without overthinking the prefixes.

IN PLAIN TERMS

This topic converts metric liquid measures by moving between liters and milliliters.

KEY PARTS

- Metric capacity units include milliliters and liters.
- These units also follow base-10 patterns.
- Capacity conversions in metric often use decimal movement.

RULES AND FORMULAS

- 1,000 milliliters = 1 liter.
- Multiply when changing liters to milliliters.
- Divide when changing milliliters to liters.

LOOK FOR: whether you are moving to a bigger or smaller metric unit and where the decimal should end up.

VIDEO EXAMPLE

Convert 2.3 L to mL.

SCAN FOR VIDEO WALKTHROUGH

youtu.be/F9z7aQTqCpA?si=vVmBq6KeBET2S8UF&t=9

Answer: 2300 mL

1. Convert 2.8 liters to milliliters.

Answer: 2800 mL

2. Convert 1.2 liters to kiloliters.

Answer: 0.0012 kL

3. Convert 5400 milliliters to liters.

Answer: 5.4 L

4. Convert 3.6 liters to centiliters.

Answer: 360 cL

5. Convert 125 liters to kiloliters.

Answer: 0.125 kL

6. Convert 875 milliliters to liters.

Answer: 0.875 L

7. Convert 0.09 kiloliters to liters.

Answer: 90 L

8. Convert 14.2 liters to milliliters.

Answer: 14,200 mL

Module 4P US and Metric Conversions

This is about switching between the US system and the metric system in the kinds of conversions students see most.

IN PLAIN TERMS

This topic moves between U.S. customary units and metric units by using a known conversion fact.

KEY PARTS

- Some problems convert between customary and metric units.
- These use given benchmark facts, not just same-system conversions.
- Approximate answers are common in this topic.

RULES AND FORMULAS

- Use the conversion fact provided, such as 1 inch ≈ 2.54 centimeters.
- Set up the conversion so the starting unit cancels.
- Round only as directed.

LOOK FOR: the given benchmark conversion and whether the final answer should be approximate.

VIDEO EXAMPLE

The GPS showed a travel distance of 81 km from Montego Bay to Negril. To the nearest whole number, how many miles is that? Use $1\ \text{km} \approx 0.62\ \text{mi}$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/dfHUVF6icfc?si=nb0lMBsxteFCo-PO&t=16

Answer: 50 mi

VIDEO EXAMPLE

A recipe calls for 3.2 kilograms of pork shoulder. How much should John ask the butcher for in pounds? Use the conversion factor $0.45\ \text{kg} = 1\ \text{lb}$.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/VsAr-0N9BGw?si=Ft5WmWwYNs48DQlR&t=6

Answer: about 7.1 lb

1. Convert 1.5 liters to fluid ounces. Use $1\ \text{L} \approx 1.06\ \text{qt}$ and $1\ \text{qt} = 32\ \text{fl oz}$. Round to two decimal places.

Answer: 50.88 fl oz

2. Convert 18 inches to centimeters. Use $1\ \text{in.} = 2.54\ \text{cm}$. Round to two decimal places.

Answer: 45.72 cm

3. Convert 3500 grams to ounces. Use $1\ \text{g} \approx 0.04\ \text{oz}$.

Answer: 140 oz

4. Convert 12 kilometers to miles. Use $1\ \text{km} \approx 0.62\ \text{mi}$. Round to two decimal places.

Answer: 7.44 mi

5. Convert 2.5 gallons to liters. Use $1\ \text{gal} \approx 3.79\ \text{L}$. Round to two decimal places.

Answer: 9.48 L

6. Convert 150 pounds to kilograms. Use $2.2\ \text{lb} \approx 1\ \text{kg}$. Round to two decimal places.

Answer: 68.18 kg

7. A ribbon is 30 centimeters long. Convert this length to inches. Use $1\ \text{in.} = 2.54\ \text{cm}$. Round to two decimal places.

Answer: 11.81 in

8. A race route is 5 miles long. Convert this distance to kilometers. Use $1\ \text{mi} \approx 1.61\ \text{km}$. Round to two decimal places.

Answer: 8.05 km

Module 4Q Temperature Conversions

Change temperatures between Fahrenheit and Celsius and get used to what those numbers mean.

IN PLAIN TERMS

This topic converts temperatures between Fahrenheit and Celsius using the correct formula.

KEY PARTS

- Temperature is converted with formulas, not just a unit ratio.
- Fahrenheit and Celsius scales measure the same physical idea in different ways.
- Order of operations matters in these formulas.

RULES AND FORMULAS

- $C = \frac{5}{9}(F - 32)$.
- $F = \frac{9}{5}C + 32$.
- Subtract or add 32 in the correct place before finishing the calculation.

LOOK FOR: which formula matches the starting unit and when to apply the 32 adjustment.

VIDEO EXAMPLE

Convert 98°F to °C.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/GxLoFH08wSw?si=8MkQXeC19RbVTljY&t=9

Answer: 36.7°C

VIDEO EXAMPLE

Convert 48°C to °F.

SCAN FOR VIDEO WALKTHROUGH
youtu.be/GxLoFH08wSw?si=BC6_pVHDHVa9XTMT&t=113

Answer: 118.4°F

1. Convert 95°F to degrees Celsius.

Answer: 35°C

2. Convert 68°F to degrees Celsius.

Answer: 20°C

3. Convert 20°C to degrees Fahrenheit.

Answer: 68°F

4. Convert 48°C to degrees Fahrenheit.

Answer: 118.4°F

5. Convert -4°F to degrees Celsius.

Answer: -20°C

6. Convert 86.9°F to degrees Celsius.

Answer: 30.5°C

7. Convert -12°C to degrees Fahrenheit.

Answer: 10.4°F

8. Convert 18.6°C to degrees Fahrenheit.

Answer: 65.48°F

9. A freezer is set to 14°F. Convert this temperature to degrees Celsius.

Answer: -10°C

10. A classroom measures 23°C. Convert this temperature to degrees Fahrenheit.

Answer: 73.4°F