

SAT Math Formula Sheet

Connect algebra, rates, data and geometry formulas to the conditions that make them useful. Each entry includes an original worked example and links to existing lessons and practice.

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Scope and review status

Selected SAT Math study formulas across the four current content domains. Official provided-status labels were checked against Fall 2026 Bluebook directions, physical page 8; supplementary formulas are identified separately. This is not a complete syllabus, official reference-sheet reproduction or score guarantee.

Original examples and source-located provided-status checks; independent agent review and qualified educator review are separate. Existing linked practice retains its published foundation scope.

Independent content review: peer checked. Qualified educator review: pending.

This is an original study resource, not an official examination, endorsement, score prediction or certification.

<https://openexam.site/exams/sat-math/formula-sheet/>

Quick-reference index

Find a relationship here, then read its variables, conditions, exam-reference status and worked example in the detailed sections.

FORMULA / RELATIONSHIP	QUICK REFERENCE / CHECK CONDITIONS BELOW
Solve a linear equation	For $a \cdot x + b = c$ and $a \neq 0$, $x = (c - b) / a$.
Slope and a line through a point	$m = (y_2 - y_1) / (x_2 - x_1)$; $y - y_1 = m(x - x_1)$; $y = m \cdot x + b$.
Products, quotients and powers of powers	$a^m \cdot a^n = a^{(m+n)}$; $a^m / a^n = a^{(m-n)}$; $(a^m)^n = a^{(m \cdot n)}$.
Quadratic formula and real-root check	For $a \cdot x^2 + b \cdot x + c = 0$, $x = (-b \pm \sqrt{b^2 - 4 \cdot a \cdot c}) / (2 \cdot a)$; $D = b^2 - 4 \cdot a \cdot c$.
Vertex form and the turning point	For $f(x) = a \cdot x^2 + b \cdot x + c$ with $a \neq 0$, the vertex is (h, k) , where $h = -b / (2 \cdot a)$ and $k = f(h)$.
Difference of squares	$u^2 - v^2 = (u - v)(u + v)$.
Unit rate and distance	$v = d / t$ and $d = v \cdot t$.
Divide a total in a stated ratio	If $A:B = a:b$, then $A = a \cdot T / (a + b)$ and $B = b \cdot T / (a + b)$.
Percent change and a multiplier	$r = (\text{new} - \text{old}) / \text{old}$; $\text{new} = \text{old} \cdot (1 + r)$; percent change = $100 \cdot r$ percent.
Repeated proportional change	$A = P \cdot (1 + r)^t$.

FORMULA / RELATIONSHIP	QUICK REFERENCE / CHECK CONDITIONS BELOW
Mean from values and frequencies	$\text{mean} = \frac{\sum(\text{frequency}_i \cdot \text{value}_i)}{\sum(\text{frequency}_i)}$.
Conditional probability from a count table	For equally weighted observations, $P(A \text{ given } B) = \frac{\text{count}(A \text{ and } B)}{\text{count}(B)}$.
Observed value minus prediction	$\text{residual} = \text{observed } y - \text{predicted } y$.
Areas of a rectangle, triangle and circle	rectangle area = $l \cdot w$; triangle area = $\frac{b \cdot h}{2}$; circle area = $\pi \cdot r^2$.
Circumference of a circle	$C = 2 \cdot \pi \cdot r = \pi \cdot d$.
Pythagorean theorem	For a right triangle, $a^2 + b^2 = c^2$.
Special right-triangle side ratios	45-45-90 sides: $s, s, s\sqrt{2}$. 30-60-90 sides opposite 30, 60, 90 degrees: $x, x\sqrt{3}, 2x$.
Sine, cosine and tangent in a right triangle	$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$; $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$; $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$.
Similarity and geometric scaling	For similar figures, length factor = k , area factor = k^2 and volume factor = k^3 .
Distance and midpoint in the coordinate plane	distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$; midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.
Center-radius equation of a circle	$(x - h)^2 + (y - k)^2 = r^2$.
Triangle angle sum and degree-radian conversion	Triangle interior angles total 180 degrees; radians = degrees $\cdot \pi / 180$.
Arc length and sector area	For an angle θ in degrees, arc length = $\frac{\theta}{360} \cdot 2\pi r$; sector area = $\frac{\theta}{360} \cdot \pi r^2$.
Volume of a rectangular prism	$V = l \cdot w \cdot h$.
Volume of a right circular cylinder	$V = \pi \cdot r^2 \cdot h$.
Volume of a sphere	$V = \frac{4}{3} \cdot \pi \cdot r^3$.
Volume of a right circular cone	$V = \frac{1}{3} \cdot \pi \cdot r^2 \cdot h$.
Volume of a rectangular-base pyramid	$V = \frac{1}{3} \cdot l \cdot w \cdot h$.

Conditions and worked examples

Use the formula after identifying the relationship

This is an independently written study reference, not a copy of the official reference sheet and not a complete list of every fact the SAT can assess. The worked examples below are original teaching examples. Each formula links to existing OpenExam lessons and related practice; those linked questions are additional practice, not the example printed here.

The official Fall 2026 Bluebook directions show the complete reference sheet on physical page 8. We inspected that page to label each entry as provided, supplemental, or a derivation from provided facts. The current assessment framework is Version 4, September 2026. Check the reference tool in your own Bluebook test preview before test day.

- Name the requested quantity and its units before substituting numbers.
- Check nonzero denominators, real square roots, and whether a triangle is actually right.
- Keep exact fractions and multiples of pi until a decimal approximation is requested.
- A supplied formula does not choose the right model or establish that its conditions hold.

Algebra and quadratic structure

Equations preserve relationships. Before using a shortcut, identify what can be divided, which solutions are real, and what quantity the question actually asks for.

Solve a linear equation

$$ax + b = c \implies x = \frac{c - b}{a}$$

Plain text: For $a \cdot x + b = c$ and $a \neq 0$, $x = (c - b)/a$.

Variables: a : nonzero coefficient of x ; b and c : real constants; x : unknown real value

Conditions: a must be nonzero. If $a = 0$, inspect whether $b = c$ instead of dividing.; Apply each operation to the entire side; substitute the answer into the original equation.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Solve $5x - 7 = 18$.

1. Add 7 to both sides: $5x = 25$.
2. Divide by 5: $x = 5$.
3. Check: $5(5) - 7 = 18$.

Answer: $x = 5$

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Slope and a line through a point

$$m = \frac{y_2 - y_1}{x_2 - x_1}, \quad y - y_1 = m(x - x_1), \quad y = mx + b$$

Plain text: $m=(y_2-y_1)/(x_2-x_1)$; $y-y_1=m*(x-x_1)$; $y=m*x+b$.

Variables: (x_1, y_1) , (x_2, y_2) : distinct points on a nonvertical line; m : change in y per one unit of x ; b : y -intercept

Conditions: x_2 must differ from x_1 ; a vertical line has equation $x=\text{constant}$ and undefined slope.; A slope has units of y -units per x -unit; an intercept need not be a meaningful real-world value outside the data range.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Find an equation of the line through $(2, 5)$ and $(6, 13)$.

1. Compute $m=(13-5)/(6-2)=8/4=2$.
2. Use $y-5=2(x-2)$, then simplify to $y=2x+1$.
3. Check that both supplied points satisfy the equation.

Answer: $y=2x+1$

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Products, quotients and powers of powers

$$a^m a^n = a^{m+n}, \quad \frac{a^m}{a^n} = a^{m-n}, \quad (a^m)^n = a^{mn}$$

Plain text: $a^m*a^n=a^{(m+n)}$; $a^m/a^n=a^{(m-n)}$; $(a^m)^n=a^{(m*n)}$.

Variables: a : common base; m, n : integer exponents in these rules

Conditions: Use the same base for the product and quotient rules; a must be nonzero for division or negative exponents.; Real fractional exponents require additional domain care, especially for even roots; the integer-exponent rules here do not remove those restrictions.; All displayed powers must be defined. In particular, do not use these rules to assign a value to 0^0 ; zero to a nonpositive integer power is excluded here.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Simplify $(2^3 \times 2^4)/2^2$.

1. Combine the numerator to $2^{(3+4)}=2^7$.
2. Subtract the denominator exponent: $2^{(7-2)}=2^5$.
3. Evaluate $2^5=32$.

Answer: 32

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Quadratic formula and real-root check

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \quad D = b^2 - 4ac$$

Plain text: For $a \cdot x^2 + b \cdot x + c = 0$, $x = (-b \pm \sqrt{b^2 - 4 \cdot a \cdot c}) / (2 \cdot a)$; $D = b^2 - 4 \cdot a \cdot c$.

Variables: a,b,c: real coefficients with $a \neq 0$; D: discriminant; x: candidate root

Conditions: Write the equation equal to zero before identifying a,b,c.; For real solutions, D must be nonnegative: $D=0$ gives one repeated real root; $D>0$ gives two distinct real roots.; The negative sign in $-b$ belongs to the whole coefficient b.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Solve $2x^2 - 7x + 3 = 0$.

1. Identify $a=2$, $b=-7$, $c=3$.
2. Compute $D=(-7)^2 - 4(2)(3)=25$.
3. $x=(7 \pm 5)/4$, so $x=3$ or $x=1/2$.

Answer: $x=3$ or $x=1/2$

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Vertex form and the turning point

$$y = a(x - h)^2 + k, \quad h = -\frac{b}{2a}, \quad k = f(h)$$

Plain text: For $f(x)=a \cdot x^2 + b \cdot x + c$ with $a \neq 0$, the vertex is (h,k), where $h=-b/(2 \cdot a)$ and $k=f(h)$.

Variables: a,b,c: coefficients of the quadratic; h: x-coordinate of the vertex; k: y-coordinate of the vertex

Conditions: $a \neq 0$. The vertex is a minimum when $a>0$ and a maximum when $a<0$.; The form $x-h$ has the opposite displayed sign from the vertex coordinate h.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Find the vertex of $f(x)=2x^2-8x+1$.

1. Compute $h=-(-8)/(2 \times 2)=2$.
2. Compute $k=f(2)=8-16+1=-7$.
3. Equivalently, $f(x)=2(x-2)^2-7$.

Answer: The vertex is $(2,-7)$, a minimum.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Difference of squares

$$u^2 - v^2 = (u - v)(u + v)$$

Plain text: $u^2-v^2=(u-v)*(u+v)$.

Variables: u,v : real expressions

Conditions: This is a difference, not a sum: u^2+v^2 does not factor this way over the reals.; If dividing by a factor later, keep the original excluded values.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Factor x^2-16 and solve $x^2-16=0$.

1. Write $16=4^2$.
2. Factor $x^2-4^2=(x-4)(x+4)$.
3. A product is zero when at least one factor is zero.

Answer: $(x-4)(x+4)$; solutions $x=4$ and $x=-4$.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

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Ratios, percent changes and exponential models

Use a baseline and a consistent time unit. A 15% increase followed by a 15% decrease does not restore the starting value because the second percentage uses a different baseline.

Unit rate and distance

$$v = \frac{d}{t}, \quad d = vt$$

Plain text: $v=d/t$ and $d=v \cdot t$.

Variables: d: distance; t: nonzero elapsed time; v: constant speed or average speed over that interval

Conditions: Use compatible units; $t > 0$ for an elapsed-time calculation.; $d=v \cdot t$ uses a constant rate or the average rate for the entire interval, not an arbitrary instantaneous speed.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

A trip covers 150 km in 2.5 hours. Find its average speed.

1. Divide total distance by total time: $150/2.5=60$.
2. Attach the compound unit km per hour.

Answer: 60 km/h

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Divide a total in a stated ratio

$$A = \frac{a}{a+b}T, \quad B = \frac{b}{a+b}T$$

Plain text: If $A:B=a:b$, then $A=a \cdot T/(a+b)$ and $B=b \cdot T/(a+b)$.

Variables: a,b: nonnegative ratio parts with $a+b > 0$; T: total amount; A,B: component amounts

Conditions: The total T must consist of exactly these two components.; If individual objects are counted, the resulting counts must fit the problem's whole-number constraints.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Red and blue counters are in a 3:5 ratio, with 64 counters altogether. Find both counts.

1. There are $3+5=8$ ratio parts, so one part is $64/8=8$.
2. Red: $3 \times 8=24$. Blue: $5 \times 8=40$.
3. Check $24+40=64$ and $24:40=3:5$.

Answer: 24 red and 40 blue

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Percent change and a multiplier

$$r = \frac{\text{new} - \text{old}}{\text{old}}, \quad \text{new} = \text{old}(1 + r)$$

Plain text: $r = (\text{new} - \text{old}) / \text{old}$; $\text{new} = \text{old} * (1 + r)$; percent change = $100 * r$ percent.

Variables: old: nonzero starting value; new: ending value; r: signed proportional change written as a decimal

Conditions: For an ordinary percent increase/decrease interpretation, use a positive starting value.; A decrease has $r < 0$. Reverse the change by dividing by $1 + r$, not by subtracting the same percentage from the new value.; Recovering the old value by division also requires $1 + r \neq 0$. After a 100% decrease ($r = -1$), a zero new value cannot uniquely reveal the original amount.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

A price rises from \$80 to \$92. Find the percentage increase and recover the original price from \$92.

1. $r = (92 - 80) / 80 = 12 / 80 = 0.15$, or 15%.

2. The multiplier is 1.15.

3. Reverse it: $92 / 1.15 = 80$.

Answer: 15% increase; original price \$80.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Repeated proportional change

$$A = P(1 + r)^t$$

Plain text: $A = P * (1 + r)^t$.

Variables: P: initial amount; r: signed change per period as a decimal; t: number of equal periods; A: amount after t periods

Conditions: The same proportional multiplier must apply each period; t uses the same period as r.; For an ordinary growth/decay model, use $1 + r > 0$. A fixed added amount is a linear, not exponential, model.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

An original model starts at 1,200 units and grows 4% per year. Find its value after 3 years.

1. The annual multiplier is $1+0.04=1.04$.
2. $A=1200(1.04)^3=1349.8368$.
3. If a whole-unit approximation is requested, round only at the end.

Answer: 1,349.8368 units, approximately 1,350 units.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Data summaries, conditional probability and model errors

A denominator is part of the question. Decide whether you are describing all observations or only the observations allowed by a condition. A fitted prediction and an observed result are different quantities.

Mean from values and frequencies

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

Plain text: $\text{mean} = \text{sum}(\text{frequency}_i \times \text{value}_i) / \text{sum}(\text{frequency}_i)$.

Variables: x_i : numerical value; f_i : nonnegative count or weight for x_i ; $\sum f_i$: positive total count or weight

Conditions: Frequency counts represent the number of occurrences; do not average the distinct labels alone.; A grouped interval table generally gives an estimate using midpoints, not an exact mean of unknown individual values.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

A data set contains two 3s and three 7s. Find the mean.

1. Total value is $2 \times 3 + 3 \times 7 = 27$.
2. Total count is $2 + 3 = 5$.
3. $\text{Mean} = 27/5 = 5.4$.

Answer: 5.4

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Conditional probability from a count table

$$P(A \mid B) = \frac{n(A \cap B)}{n(B)}$$

Plain text: For equally weighted observations, $P(A \text{ given } B) = \text{count}(A \text{ and } B) / \text{count}(B)$.

Variables: A,B: events; $n(B)$: number of observations satisfying B; $n(A \text{ and } B)$: observations satisfying both

Conditions: The conditioning group B must contain at least one observation.; Use its group total, not the grand total; unequal selection probabilities need a probability-weighted calculation.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Of 30 commuters, 12 cycle. Five of those 12 wear helmets. Among the cyclists, what proportion wear helmets?

1. Restrict the denominator to the 12 cyclists.
2. Five satisfy both conditions, so the conditional proportion is $5/12$.
3. $5/30$ would instead be the joint proportion among all commuters.

Answer: $5/12$

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Observed value minus prediction

$$e = y - \hat{y}$$

Plain text: residual=observed y-predicted y.

Variables: y: observed response; $\hat{y}$: model-predicted response at the supplied x; e: residual, in response units

Conditions: Use the prediction for the same explanatory value x.; A positive residual means the observation is above the model, not that the slope is positive.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

A fitted model predicts 24 minutes, but the observed time is 29 minutes. Find and interpret the residual.

1. Compute $e = 29 - 24 = 5$ minutes.
2. The observed time is 5 minutes greater than the prediction.

Answer: Residual +5 minutes.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Plane geometry and right triangles

A sketch is not a reason to assume a right angle, equal lengths or similarity. Use the stated relationships and distinguish a slanted side from a perpendicular height.

Areas of a rectangle, triangle and circle

$$A_{\text{rect}} = lw, \quad A_{\text{tri}} = \frac{1}{2}bh, \quad A_{\text{circle}} = \pi r^2$$

Plain text: rectangle area= $l \times w$; triangle area= $b \times h / 2$; circle area= $\pi \times r^2$.

Variables: l, w : rectangle side lengths; b : triangle base; h : perpendicular height to that base; r : circle radius; A : area

Conditions: Lengths must use the same units; area uses squared units.; A triangle's h is perpendicular to its chosen base. For a circle, use radius, not diameter.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

Find the areas of an 8 cm by 3 cm rectangle, a triangle with base 10 cm and perpendicular height 7 cm, and a circle of radius 3 cm.

1. Rectangle: $8 \times 3 = 24 \text{ cm}^2$.

2. Triangle: $(1/2) \times 10 \times 7 = 35 \text{ cm}^2$.

3. Circle: $\pi \times 3^2 = 9\pi \text{ cm}^2$.

Answer: 24 cm^2 ; 35 cm^2 ; $9\pi \text{ cm}^2$.

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Circumference of a circle

$$C = 2\pi r = \pi d$$

Plain text: $C = 2 \times \pi \times r = \pi \times d$.

Variables: r : radius; $d = 2r$: diameter; C : distance around the circle

Conditions: Use length units, not squared units.; The official sheet prints $C = 2\pi r$; $C = \pi \times d$ is the equivalent substitution $d = 2r$.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A circle has diameter 10 cm. Find its circumference.

1. The radius is $10/2=5$ cm.
2. $C=2\pi(5)=10\pi$ cm.

Answer: 10π cm

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Pythagorean theorem

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

Plain text: For a right triangle, $a^2+b^2=c^2$.

Variables: a,b: perpendicular legs; c: hypotenuse opposite the right angle

Conditions: This form applies to a right triangle.; The hypotenuse is the longest side; to recover a length, take the nonnegative square root.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A right triangle has legs 9 and 12. Find the hypotenuse.

1. $c^2=9^2+12^2=81+144=225$.
2. $c=\sqrt{225}=15$ because a length is nonnegative.

Answer: 15 length units

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Special right-triangle side ratios

$$45^\circ : 45^\circ : 90^\circ : s, s, s\sqrt{2}; \quad 30^\circ : 60^\circ : 90^\circ : x, x\sqrt{3}, 2x$$

Plain text: 45-45-90 sides: s, s, $s\sqrt{2}$. 30-60-90 sides opposite 30,60,90 degrees: x, $x\sqrt{3}$, $2x$.

Variables: s: either leg of a 45-45-90 triangle; x: short leg opposite 30 degrees in a 30-60-90 triangle

Conditions: The angle labels determine which side receives each factor.; Do not treat an arbitrary right triangle as one of these special triangles.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A 45-45-90 triangle has leg 6. A different 30-60-90 triangle has short leg 5. Find their missing sides.

1. The first has other leg 6 and hypotenuse $6\sqrt{2}$.
2. The second has long leg $5\sqrt{3}$ and hypotenuse 10.

Answer: First: 6 and $6\sqrt{2}$. Second: $5\sqrt{3}$ and 10.

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Sine, cosine and tangent in a right triangle

$$\sin \theta = \frac{o}{h}, \quad \cos \theta = \frac{a}{h}, \quad \tan \theta = \frac{o}{a}$$

Plain text: $\sin(\theta)$ =opposite/hypotenuse; $\cos(\theta)$ =adjacent/hypotenuse; $\tan(\theta)$ =opposite/adjacent.

Variables: θ : a chosen acute angle of a right triangle; o: leg opposite θ ; a: leg adjacent to θ ; h: hypotenuse

Conditions: These side-ratio definitions use a right triangle and positive side lengths.; Name the reference angle before assigning opposite and adjacent; use the calculator's required degree/radian mode.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Relative to an acute angle θ , a right triangle has opposite leg 3, adjacent leg 4 and hypotenuse 5. Find the three ratios.

1. $\sin(\theta)=3/5$.
2. $\cos(\theta)=4/5$.
3. $\tan(\theta)=3/4$.

Answer: $\sin(\theta)=3/5$, $\cos(\theta)=4/5$, $\tan(\theta)=3/4$.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Similarity and geometric scaling

$$\frac{L_2}{L_1} = k, \quad \frac{A_2}{A_1} = k^2, \quad \frac{V_2}{V_1} = k^3$$

Plain text: For similar figures, length factor= k , area factor= k^2 and volume factor= k^3 .

Variables: $k>0$: common linear scale factor; L: corresponding length; A: area; V: volume

Conditions: Every corresponding length must use the same factor k .; The volume rule applies to similar three-dimensional solids, not just equal-looking drawings.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Similar solids have corresponding lengths in a 3:1 ratio. The smaller solid has volume 10 cm³. Find the larger volume.

1. The linear factor from smaller to larger is $k=3$.
2. The volume factor is $3^3=27$.
3. The larger volume is $27 \times 10 = 270$ cm³.

Answer: 270 cm³

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Coordinates, circles and angle measures

Use coordinates to recover lengths and centers. For arcs and sectors, first check whether an angle is given in degrees or radians; a radius and a diameter are not interchangeable.

Distance and midpoint in the coordinate plane

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}, \quad M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Plain text: distance= $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$; midpoint= $((x_1+x_2)/2,(y_1+y_2)/2)$.

Variables: $(x_1,y_1),(x_2,y_2)$: points in a rectangular coordinate system; d: nonnegative distance; M: midpoint

Conditions: Both coordinates must use the same distance scale for this Euclidean formula.; Coordinate differences can be negative before squaring; distance cannot be negative.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Find the distance and midpoint between $(-1,2)$ and $(5,10)$.

1. The changes are $5-(-1)=6$ and $10-2=8$.
2. Distance= $\sqrt{6^2+8^2}=\sqrt{100}=10$.
3. Midpoint= $((-1+5)/2,(2+10)/2)=(2,6)$.

Answer: Distance 10; midpoint $(2,6)$.

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Center-radius equation of a circle

$$(x - h)^2 + (y - k)^2 = r^2$$

Plain text: $(x-h)^2+(y-k)^2=r^2$.

Variables: (h,k) : center; $r>0$: radius; (x,y) : any point on the circle

Conditions: Read the center from $x-h$ and $y-k$, including their signs.; The right-hand side is r^2 , not r ; squared radius must be positive for a nondegenerate real circle.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

Write the equation of the circle with center $(2,-3)$ and radius 4.

1. Substitute $h=2$, $k=-3$ and $r=4$.
2. $y-(-3)$ becomes $y+3$, and $r^2=16$.

Answer: $(x-2)^2+(y+3)^2=16$

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026)

[Continue with the related lesson](#)

Triangle angle sum and degree-radian conversion

$$\alpha + \beta + \gamma = 180^\circ, \quad \theta_{\text{rad}} = \theta_{\text{deg}} \frac{\pi}{180}$$

Plain text: Triangle interior angles total 180 degrees; radians=degrees*pi/180.

Variables: α, β, γ : interior angles of a plane triangle; $\theta_{\text{deg}}, \theta_{\text{rad}}$: measures of the same angle

Conditions: The official sheet supplies the 180-degree triangle sum and 360 degrees= 2π radians for a full circle. The conversion formula here is derived from those supplied facts.; Use the same angle unit throughout an equation.

Exam reference: Provided facts: triangle sum 180 degrees, full circle 360 degrees and 2π radians appear on physical page 8. The conversion equation is a derived study relationship.

Worked example

A triangle has two angles 40° and 65° . Find the third angle and express a separate 150° angle in radians.

1. Third angle= $180-40-65=75^\circ$.
2. $150^\circ \times \pi/180=5\pi/6$ radians.

Answer: 75° ; $5\pi/6$ radians.

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Arc length and sector area

$$s = \frac{\theta}{360^\circ} 2\pi r, \quad A = \frac{\theta}{360^\circ} \pi r^2$$

Plain text: For an angle θ in degrees, arc length $= (\theta/360) \times 2\pi r$; sector area $= (\theta/360) \times \pi r^2$.

Variables: θ : central angle in degrees; r : radius; s : arc length; A : sector area

Conditions: For these displayed forms θ is measured in degrees, normally $0 \leq \theta \leq 360$ for one sector.; The formulas are derived from the corresponding fraction of a full circle. An arc has length units; a sector has squared units.

Exam reference: Not listed on the official Fall 2026 Bluebook reference sheet (physical page 8). This is a supplemental study relationship; an individual question may supply additional information.

Worked example

A circle has radius 6 cm and a central angle of 60° . Find the corresponding arc length and sector area.

1. The sector is $60/360 = 1/6$ of the circle.
2. Arc length $= (1/6) \times 2\pi \times 6 = 2\pi$ cm.
3. Sector area $= (1/6) \times \pi \times 6^2 = 6\pi$ cm².

Answer: Arc length 2π cm; sector area 6π cm².

Reference: Assessment Framework for the Digital SAT Suite (Version 4, September 2026); SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Volumes: choose a base and a perpendicular height

Use cubic units and distinguish a solid's vertical height from a slant height. These five volume relationships are on the inspected official sheet. The worksheet examples below use new dimensions and original prompts.

Volume of a rectangular prism

$$V = lwh$$

Plain text: $V = l \times w \times h$.

Variables: l, w, h : mutually perpendicular edge lengths; V : volume

Conditions: All lengths use the same unit.; This product assumes a rectangular prism, not a general solid with three labeled edges.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A rectangular box measures 4 cm by 3 cm by 5 cm. Find its volume.

1. Multiply the three perpendicular dimensions: $4 \times 3 \times 5 = 60$.
2. The resulting unit is cm^3 .

Answer: 60 cm^3

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Volume of a right circular cylinder

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

Plain text: $V = \pi r^2 h$.

Variables: r: base radius; h: perpendicular height; V: volume

Conditions: Use radius, not diameter, and a perpendicular height.; The base is circular and its area is πr^2 .

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A right circular cylinder has radius 3 cm and height 8 cm. Find its volume.

1. Base area = $\pi \times 3^2 = 9\pi \text{ cm}^2$.
2. Volume = $9\pi \times 8 = 72\pi \text{ cm}^3$.

Answer: $72\pi \text{ cm}^3$

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Volume of a sphere

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

Plain text: $V = \frac{4}{3} \pi r^3$.

Variables: r: sphere radius; V: volume

Conditions: Use the distance from the center to the surface, not the full diameter.; Cube the radius; this is not a surface-area formula.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A sphere has radius 3 cm. Find its volume.

1. $r^3 = 3^3 = 27 \text{ cm}^3$.
2. $V = (4/3)\pi \times 27 = 36\pi \text{ cm}^3$.

Answer: $36\pi \text{ cm}^3$

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Volume of a right circular cone

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

Plain text: $V = (1/3) \times \pi \times r^2 \times h$.

Variables: r: circular base radius; h: perpendicular height; V: volume

Conditions: The height is perpendicular to the base, not the slant length.; Keep the factor 1/3; a matching cylinder has three times this volume.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A right circular cone has radius 4 cm and perpendicular height 9 cm. Find its volume.

1. Base area = $16\pi \text{ cm}^2$.
2. $V = (1/3) \times 16\pi \times 9 = 48\pi \text{ cm}^3$.

Answer: $48\pi \text{ cm}^3$

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Volume of a rectangular-base pyramid

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

Plain text: $V = (1/3) \times l \times w \times h$.

Variables: l, w: perpendicular side lengths of the rectangular base; h: perpendicular height from apex to base plane; V: volume

Conditions: The official displayed form uses a rectangular base. More generally the base-area form is $V = (1/3) \times B \times h$, but B must be calculated for the actual base.; A slant height is not the perpendicular h.

Exam reference: Yes. The official Fall 2026 Bluebook directions, physical page 8, display this relationship in the Math reference sheet.

Worked example

A pyramid has a 6 cm by 5 cm rectangular base and perpendicular height 9 cm. Find its volume.

1. Base area = $6 \times 5 = 30 \text{ cm}^2$.

2. $V = \frac{1}{3} \times 30 \times 9 = 90 \text{ cm}^3$.

Answer: 90 cm^3

Reference: SAT School Day Bluebook Test Directions — Fall 2026 (Fall 2026; title-page version checked)

[Continue with the related lesson](#)

Method choice and common errors

Before opening a calculator, write a short equation naming the unknown. If the prompt asks for a derived expression, solving for x may only be an intermediate step. After calculation, check the units, whether the magnitude is plausible and whether a candidate value lies in the original domain.

This reference does not replace instruction on inequalities, systems, functions, sampling design or interpretation of distributions. Those ideas often require reasoning rather than a remembered formula. The linked lessons show the method and its limitations.

- Do not cancel across addition, divide by an expression that could be zero, or keep an extraneous root after squaring.
- For successive percent changes multiply the factors; do not add signed percentages unless the model warrants it.
- For geometry select area, perimeter or volume before calculating, and check whether the requested dimension is radius, diameter or height.
- A model's slope, a residual and evidence of causation answer different questions.

REFERENCE TRAIL

Sources, version and scope

The linked materials are references for the independently authored explanation and task design. Public access does not imply permission to reproduce an official examination bank.

College Board: The SAT Math Section

<https://satsuite.collegeboard.org/sat/whats-on-the-test/math>

Reference version: Current public page retrieved 2026-10-28

Locator: Math domains: Algebra, Advanced Math, Problem-Solving and Data Analysis, Geometry and Trigonometry; saved as sat-math-scope.html.

SAT School Day Bluebook Test Directions — Fall 2026

<https://satsuite.collegeboard.org/media/pdf/english-sat-test-directions-bb.pdf>

Reference version: Fall 2026; title-page version checked

Locator: Physical pages 6–8: Math directions and reference sheet; page 8 visually checked against original PDF.

Assessment Framework for the Digital SAT Suite

<https://satsuite.collegeboard.org/media/pdf/assessment-framework-for-digital-sat-suite.pdf>

Reference version: Version 4, September 2026

Locator: Math content specifications and Appendix B skill/knowledge testing points; used to map learning relationships, not to reproduce test questions.

College Board: What to Expect on SAT Test Day

<https://satsuite.collegeboard.org/sat/what-to-bring-do/what-to-expect>

Reference version: Current public page retrieved 2026-10-28

Locator: The Digital Testing Application: reference sheet and calculator available on Math questions.