Achievable

ACT DUMP SHEET

Plane geometry and trigonometry

Area and perimeter

Shape	Area	Perimeter
Rectangle	lw	$2l + 2w$
Square	s^2	$4s$
Parallelogram	bh, h **perpendicular**	add the sides
Rhombus	bh or $\frac{1}{2}d_1d_2$	$4s$
Triangle	$\frac{1}{2}bh$	add the sides
Trapezoid	$\frac{1}{2}(b_1 + b_2)h$	add the sides
Circle	πr^2	$C = 2\pi r$

- **Odd shape?** Break it into rectangles, triangles and circles
- **Part of a shape:** total − unwanted: $5 \times 10 - 2 \times 3 = 44$
- **Both given?** Try the choices: $lw = 8$, $2l + 2w = 12$: 4 by 2

Quadrilaterals and polygons

- **Parallelogram:** opposite sides parallel and equal, opposite angles equal, neighbors add to **180°**
- **Rectangle:** four right angles; **square:** four equal sides too
- **Rhombus:** four equal sides; diagonals **perpendicular**, unequal unless a square
- **Height** is perpendicular to the base: never a slanted side
- Angles: quadrilateral **360°**; n-sided polygon $(n - 2) \cdot 180°$

Parallel lines and a transversal

- Angles along a line are **supplementary** (sum **180°**): 50° and x give $x = 130°$
- **Vertical angles**, across a crossing, are always equal
- **Parallel lines:** one crossing's angles repeat at the other: all acute ones equal, all obtuse ones equal, acute + obtuse = **180°**
- **Not parallel:** nothing carries from one crossing to the other

Right triangle trigonometry

- **SOH CAH TOA:** $\sin\theta = \frac{\text{opp}}{\text{hyp}}$, $\cos\theta = \frac{\text{adj}}{\text{hyp}}$, $\tan\theta = \frac{\text{opp}}{\text{adj}}$
- Opposite and adjacent depend on **which angle** is θ
- **Find a side:** pick the ratio of the known and wanted sides: $\tan 50° = \frac{10}{x}$, $x \approx 8.4$
- **Find an angle:** inverse trig, **degree mode**: $\cos^{-1}\frac{2}{3} \approx 48.2°$

θ	$30°$	$45°$	$60°$
sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
tan	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$

Triangles

- Angles add to **180°**; $A = \frac{1}{2}bh$; right triangle: $a^2 + b^2 = c^2$
- $30°$-$60°$-$90°$: $x : x\sqrt{3} : 2x$; $45°$-$45°$-$90°$: $s : s : s\sqrt{2}$
- **Triples:** 3-4-5, 5-12-13, 8-15-17, and multiples such as 6-8-10
- **Triangle inequality:** two shorter sides sum to **more** than the longest: 7, 8, 14 yes; 7, 8, 18 no
- **Equilateral:** all equal (60°); **isosceles:** two sides, two angles; **scalene:** none
- **Congruent:** SSS, SAS, ASA, AAS, or HL for right triangles; never SSA or AAA
- **Similar:** equal angles, **proportional** sides: $\frac{12}{6} = \frac{8}{x}$, so $x = 4$

Circles

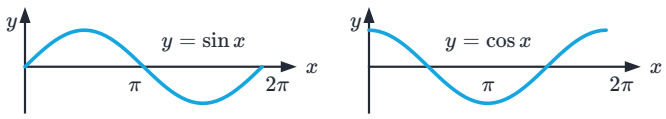
- $d = 2r$: halve a diameter first: $d = 8 \to r = 4$, $A = 16\pi$
- **Arc length** $s = \frac{\theta}{360} \cdot 2\pi r$; in radians, $s = r\theta$
- **Sector area** $\frac{\theta}{360} \cdot \pi r^2$
- Angles around the center add to **360°** (2π radians)
- "In terms of π": leave π in the answer, 4π not 12.57

Solids

Solid	Volume	Surface area
Rectangular box	lwh	$2lw + 2lh + 2wh$
Cube	s^3	$6s^2$
Cylinder	$\pi r^2 h$	$2\pi r^2 + 2\pi rh$
Sphere	$\frac{4}{3}\pi r^3$	$4\pi r^2$
Cone	$\frac{1}{3}\pi r^2 h$	base + side
Pyramid	$\frac{1}{3}Bh$	base + triangles

B is the base's area: any prism or cylinder is $V = Bh$. Multiply every length by k: area $\times k^2$, volume $\times k^3$.

Trig functions and graphs



- **Sine:** middle-high-middle-low-middle; **cosine:** high-middle-low-middle-high
- $a\sin(bx)$: **amplitude** $|a|$, **period** $\frac{2\pi}{|b|}$: $3\sin(2x)$ has 3 and π
- $\tan x$: zeros every π from 0; asymptotes every π from $\frac{\pi}{2}$
- $\sin^2 x + \cos^2 x = 1$; $\tan x = \frac{\sin x}{\cos x}$; π radians $= 180°$
- $\csc x = \frac{1}{\sin x}$, $\sec x = \frac{1}{\cos x}$, $\cot x = \frac{1}{\tan x}$