Pre-Algebra & Geometry

20 Essential Problems · Print Edition · Answer Key Included

PART A — PRE-ALGEBRA

Variables, expressions, equations, and number sense

Q01 Order of Operations ✦ PEMDAS

Evaluate: $3 + 4 \times (2^2 - 1)$

MEMORY POINT

Follow PEMDAS: Parentheses → Exponents → ×÷ → +–

Example: $2 + 3 \times (1^2 + 1) = 2 + 3 \times 2 = 8$

A) 28	B) 20
C) 15	D) 23

Q02 One-Step Equations ✦ ISOLATE x

Solve for x: $5x - 7 = 18$

MEMORY POINT

Do the opposite operation on both sides.

Example: $3x - 4 = 11 \rightarrow 3x = 15 \rightarrow x = 5$

A) x = 4	B) x = 5
C) x = 3	D) x = 6

Q03 Ratios & Proportions ✦ CROSS-MULTIPLY

If 3 notebooks cost $7.50, how much do 8 notebooks cost?

MEMORY POINT

Unit rate: $7.50 ÷ 3 = $2.50 per notebook

Then multiply: $2.50 × 8

A) $18.00	B) $16.00
C) $20.00	D) $22.50

Q04 Negative Numbers ✦ SAME SIGN = POSITIVE

Which expression has the greatest value?

(Choose from the options below)

MEMORY POINT
(–)×(–) = positive | (–)×(+) = negative

Same signs → positive. Different signs → negative.

A) (–4)×(–3)	B) (–6)×(2)
C) (–5)×(–2)	D) (3)×(5)

Q05 Percentages ✦ IS / OF × 100

A jacket originally priced at $80 is on sale for 35% off.

What is the sale price?

MEMORY POINT
Sale price = Original × (1 – 0.35) = Original × 0.65

Shortcut: multiply by what remains.

A) $28	B) $52
C) $45	D) $55

Q06 Simplifying Expressions ✦ COMBINE LIKE TERMS

Simplify: 4x + 3y – 2x + 5y – 1

MEMORY POINT
Group same-variable terms together.

Example: 5a + 2b – 3a = 2a + 2b

A) 2x + 8y – 1	B) 6x + 8y – 1
C) 2x + 2y – 1	D) 2x + 8y + 1

Q07 Inequalities ✦ FLIP SIGN ÷ NEGATIVE

Solve: –3x > 12

Which value of x satisfies this inequality?

MEMORY POINT
Dividing/multiplying by a negative → FLIP the sign!

–3x > 12 → x < –4

A) x = –3	B) x = –4
C) x = –5	D) x = 5

Q08 Fractions ✦ LCM → COMMON DENOM

Calculate: 2/3 + 3/4 – 1/6

MEMORY POINT
LCM(3,4,6) = 12

Convert: 8/12 + 9/12 – 2/12 = 15/12

A) 5/6	B) 5/4
C) 7/12	D) 11/12

Q09 Word Problems ✦ DEFINE VARIABLE FIRST

Jake is 3 years older than twice his sister's age.

His sister is 7. How old is Jake?

MEMORY POINT
Let s = sister's age. Jake = 2s + 3

Always write the equation before solving.

A) 14	B) 16
C) 10	D) 17

Q10 Scientific Notation ✦ MOVE DECIMAL → EXPONENT

Which number is correctly written in scientific notation?

MEMORY POINT
Format: a × 10^n where 1 ≤ a < 10

The digit before the decimal must be 1–9.

A) 42.3×10^2	B) 4.23×10^3
C) 0.423×10■	D) 423×10^1

PART B — GEOMETRY

Shapes, angles, area, perimeter, and coordinate geometry

Q11 Triangle Angles ✦ 180° TOTAL

In a triangle, two angles measure 47° and 68°.

What is the third angle?

MEMORY POINT
Sum of angles in any triangle = 180°

Third = 180° – (angle1 + angle2)

A) 65°	B) 75°
C) 55°	D) 80°

Q12 Area of Triangle ✦ ½ × BASE × HEIGHT

A triangle has a base of 14 cm and a height of 9 cm.

What is its area?

MEMORY POINT
A = ½ × b × h

Height must be perpendicular to base — not the slanted side!

A) 126 cm²	B) 46 cm²
C) 63 cm²	D) 72 cm²

Q13 Pythagorean Theorem ✦ $a^2 + b^2 = c^2$

A right triangle has legs of length 5 and 12.

What is the length of the hypotenuse?

MEMORY POINT
$a^2 + b^2 = c^2$ (c = hypotenuse, opposite the right angle)

Memorise: 3-4-5 | 5-12-13 | 8-15-17

A) 15	B) 13
C) 17	D) $\sqrt{119}$

Q14 Circle Area ✦ r = d ÷ 2 FIRST!

A circle has a diameter of 10 cm.

What is its area? (Use $\pi \approx 3.14$)

MEMORY POINT

Area = $\pi \times r^2$ | Circumference = $2\pi r = \pi d$

Biggest trap: using diameter instead of radius!

A) 78.5 cm²	B) 314 cm²
C) 31.4 cm²	D) 157 cm²

Q15 Parallel Lines & Angles ✦ ALTERNATE = EQUAL

Two parallel lines are cut by a transversal.

One angle measures 115°. What is the co-interior

(same-side interior) angle?

MEMORY POINT

Alternate interior → equal

Co-interior (same-side) → supplementary (sum = 180°)

Corresponding → equal

A) 115°	B) 65°
C) 45°	D) 75°

Q16 Perimeter — Composite Shapes ✦ OUTER EDGES ONLY

An L-shaped figure is formed by removing a 3×4 rectangle

from a 7×8 rectangle. What is the perimeter?

MEMORY POINT

Trace only the outer boundary. Cutting a notch adds two

new inside edges to the total perimeter.

A) 26 units	B) 30 units
C) 34 units	D) 38 units

Q17 Volume — Rectangular Prism ✦ l × w × h

A box is 6 cm long, 4 cm wide, and 5 cm tall.

How many 1 cm³ cubes fit exactly inside?

MEMORY POINT

Volume = length × width × height

All units must match before calculating.

A) 74	B) 148
C) 120	D) 60

Q18 Coordinate Plane — Midpoint ✦ MIDPOINT = AVERAGE

What is the midpoint of the segment connecting

(2, –3) and (8, 7)?

MEMORY POINT

Midpoint = ((x1+x2)/2 , (y1+y2)/2)

Just average each coordinate separately.

A) (3, 2)	B) (5, 2)
C) (5, 5)	D) (10, 4)

Q19 Similar Triangles ✦ RATIO = SCALE FACTOR

Two similar triangles have sides in ratio 3 : 5.

The smaller triangle has a base of 9 cm.

What is the base of the larger triangle?

MEMORY POINT

Similar triangles → equal angles, proportional sides.

Set up: 3/5 = 9/x, then cross-multiply.

A) 15 cm	B) 27 cm
C) 12 cm	D) 18 cm

Q20 Surface Area — Cube ✦ 6 FACES → 6 × s²

A cube has a side length of 4 cm.

What is its total surface area?

MEMORY POINT

A cube has 6 identical square faces.

Surface Area = 6 × s² | Volume = s³ (Don't mix up!)

A) 64 cm²	B) 48 cm²
C) 96 cm²	D) 24 cm²

ANSWER KEY

Q01 *C) 15 [3 + 4×(4–1) = 3 + 4×3 = 3 + 12 = 15]*	***Q02*** *B) x = 5 [5x = 25; x = 5]*
Q03 *C) $20.00 [$2.50 × 8 = $20.00]*	***Q04*** *D) (3)×(5) = 15 [A=12, B=–12, C=10, D=15]*
Q05 *B) $52 [$80 × 0.65 = $52]*	***Q06*** *A) 2x + 8y – 1 [x: 4–2=2; y: 3+5=8; const: –1]*
Q07 *C) x = –5 [x < –4; only –5 satisfies this]*	***Q08*** *B) 5/4 [8/12 + 9/12 – 2/12 = 15/12 = 5/4]*
Q09 *D) 17 [2×7 + 3 = 14 + 3 = 17]*	***Q10*** *B) 4.23 × 10³ [Only option with coefficient between 1 and 10]*
Q11 *A) 65° [180 – 47 – 68 = 65°]*	***Q12*** *C) 63 cm² [½ × 14 × 9 = 63; forgetting ½ gives 126]*
Q13 *B) 13 [5² + 12² = 25 + 144 = 169; √169 = 13]*	***Q14*** *A) 78.5 cm² [r=5; 3.14×25=78.5; B uses d²—common error!]*
Q15 *B) 65° [Co-interior: 180° – 115° = 65°]*	***Q16*** *D) 38 units [Original P=30; each notch adds 2 extra edges: 30+4+4=38]*
Q17 *C) 120 cm³ [6 × 4 × 5 = 120]*	***Q18*** *B) (5, 2) [x:(2+8)/2=5; y:(–3+7)/2=2]*
Q19 *A) 15 cm [3/5=9/x → 3x=45 → x=15]*	***Q20*** *C) 96 cm² [6 × 4² = 6 × 16 = 96; A=64 is the volume!]*