

# Math Master Quiz

Algebra 1 & Geometry — 20 Essential Problems

Printable Practice Sheet — Work Space Included

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 20

## Q1. [Algebra 1] Solving Linear Equations

**Key Concepts:** Key:  $ax + b = c \rightarrow x = (c-b)/a$  | Isolate variable using inverse operations

### Step 1: Solve for x: $2x + 5 = 13$

A)  $x = 3$

B)  $x = 4$

C)  $x = 9$

D)  $x = 2$

Answer: B |  $2x=8 \rightarrow x=4$

### Step 2: Solve for x: $5x - 3 = 17$

A)  $x = 4$

B)  $x = 3$

C)  $x = 5$

D)  $x = 14/5$

Answer: A |  $5x=20 \rightarrow x=4$

### Step 3: Solve for x: $-3x + 9 = 0$

A)  $x = -3$

B)  $x = 9$

C)  $x = 3$

D)  $x = 27$

Answer: C |  $-3x=-9 \rightarrow x=3$

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## Q2. [Algebra 1] Slope-Intercept Form

**Key Concepts:**  $y = mx + b$  ( $m$ =slope,  $b$ =y-intercept) | slope =  $(y_2 - y_1)/(x_2 - x_1)$

**Step 1: What is the slope of  $y = -4x + 7$ ?**

- A) 7
- B) -4
- C) 4
- D) -7

Answer: B |  $m$  is the coefficient of  $x \rightarrow m = -4$

**Step 2: Find slope through (2,5) and (6,13).**

- A) 2
- B) 3
- C) 4
- D)  $1/2$

Answer: A |  $(13 - 5)/(6 - 2) = 8/4 = 2$

**Step 3: Which has y-intercept -5?**

- A)  $y = 3x + 5$
- B)  $y = -5x + 3$
- C)  $y = 2x - 5$
- D)  $y = -2x$

Answer: C |  $b = -5$  in  $y = 2x - 5$

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### Q3. [Algebra 1] Systems of Equations

**Key Concepts:** Substitution: solve one eq for a variable | Elimination: add/subtract to cancel a variable

#### Step 1: Solve: $x+y=6$ and $x-y=2$

- A) (4,2)
- B) (3,3)
- C) (5,1)
- D) (2,4)

Answer: A | Add:  $2x=8 \rightarrow x=4$ ;  $y=2$

#### Step 2: Solve by substitution: $y=2x$ , $x+y=9$

- A) (3,6)
- B) (4,5)
- C) (2,7)
- D) (6,3)

Answer: A |  $x+2x=9 \rightarrow x=3$ ,  $y=6$

#### Step 3: How many solutions: $x+y=5$ and $2x+2y=10$ ?

- A) 0
- B) 1
- C) 2
- D) Infinitely many

Answer: D | Same line  $\rightarrow$  infinite solutions

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#### Q4. [Algebra 1] Quadratic Equations

**Key Concepts:**  $ax^2+bx+c=0$  | Quadratic formula:  $x=(-b\pm\sqrt{b^2-4ac})/2a$  | Factor:  $(x+p)(x+q)=0$

##### Step 1: Solve $x^2 - 7x + 12 = 0$

A)  $x=3$  or  $x=4$

B)  $x=6$  or  $x=2$

C)  $x=1$  or  $x=12$

D)  $x=-3$  or  $x=-4$

Answer: A |  $(x-3)(x-4)=0$

##### Step 2: Discriminant of $2x^2+3x-5=0$ ?

A) 9

B) 49

C) 29

D) -31

Answer: B |  $b^2-4ac=9+40=49$

##### Step 3: Solve $x^2 - 4x + 4 = 0$

A)  $x=4$

B)  $x=2$

C)  $x=0$  or  $x=4$

D)  $x=-2$

Answer: B |  $(x-2)^2=0 \rightarrow x=2$

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### Q5. [Algebra 1] Inequalities

**Key Concepts:** Solve like equations BUT flip sign when multiplying/dividing by negative! |  $-2x > 6 \rightarrow x < -3$

#### Step 1: Solve: $4x - 3 < 13$

A)  $x < 4$

B)  $x > 4$

C)  $x < -4$

D)  $x > -4$

Answer: A |  $4x < 16 \rightarrow x < 4$

#### Step 2: Solve: $-2x \geq 10$

A)  $x \geq -5$

B)  $x \leq -5$

C)  $x \geq 5$

D)  $x \leq 5$

Answer: B | Divide by -2, FLIP:  $x \leq -5$

#### Step 3: Which value satisfies $3x+1 > 10$ ?

A)  $x=2$

B)  $x=0$

C)  $x=3$

D)  $x=4$

Answer: D |  $3x > 9 \rightarrow x > 3$ , so  $x=4$

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## Q6. [Algebra 1] Exponent Rules

**Key Concepts:** Product:  $a^m \cdot a^n = a^{(m+n)}$  | Quotient:  $a^m / a^n = a^{(m-n)}$  | Power:  $(a^m)^n = a^{(mn)}$

### Step 1: Simplify: $x^4 \cdot x^3$

A)  $x^7$

B)  $x^{12}$

C)  $x^{43}$

D)  $2x^7$

Answer: A | Add exponents:  $x^{(4+3)}=x^7$

### Step 2: Simplify: $(2x^2)^3$

A)  $6x^6$

B)  $8x^6$

C)  $6x^5$

D)  $2x^6$

Answer: B |  $2^3 \cdot x^{(2 \cdot 3)}=8x^6$

### Step 3: Simplify: $x^6 / x^2$

A)  $x^3$

B)  $x^4$

C)  $x^8$

D)  $x^{12}$

Answer: B |  $x^{(6-2)}=x^4$

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## Q7. [Algebra 1] Functions & Domain/Range

**Key Concepts:**  $f(x)$  = expression in  $x$  | Domain: all valid inputs ( $x$ ) | Range: all possible outputs ( $y$ )

**Step 1: If  $f(x) = 3x + 2$ , find  $f(4)$**

- A) 14
- B) 12
- C) 10
- D) 16

Answer: A |  $3(4)+2=14$

**Step 2: Domain of  $f(x) = 1/(x-3)$ ?**

- A) All reals
- B)  $x \neq 0$
- C)  $x \neq 3$
- D)  $x > 3$

Answer: C | Denominator  $\neq 0 \rightarrow x \neq 3$

**Step 3: Which is a function?**

- A)  $\{(1,2),(1,3),(2,4)\}$
- B)  $\{(2,3),(3,3),(4,3)\}$
- C)  $\{(1,2),(2,1),(1,3)\}$
- D)  $\{(0,1),(0,2),(0,3)\}$

Answer: B | Each  $x$  has only one  $y$

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## Q8. [Algebra 1] Factoring Polynomials

**Key Concepts:** GCF first:  $6x^2+9x = 3x(2x+3)$  | Trinomial:  $x^2+bx+c = (x+p)(x+q)$  | Diff of squares:  $a^2-b^2=(a+b)(a-b)$

### Step 1: Factor: $x^2 + 5x + 6$

A)  $(x+2)(x+3)$

B)  $(x+1)(x+6)$

C)  $(x-2)(x-3)$

D)  $(x+3)(x-2)$

Answer: A |  $2+3=5$ ,  $2 \cdot 3=6$

### Step 2: Factor: $x^2 - 16$

A)  $(x-4)^2$

B)  $(x+4)(x-4)$

C)  $(x-8)(x+2)$

D)  $(x+16)(x-1)$

Answer: B | Diff of squares:  $(x+4)(x-4)$

### Step 3: GCF of $4x^3 - 8x^2$

A)  $4x^2(x-2)$

B)  $4x(x^2-2x)$

C)  $2x^2(2x-4)$

D)  $x^2(4x-8)$

Answer: A | GCF= $4x^2$

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## Q9. [Algebra 1] Proportions & Percent

**Key Concepts:**  $a/b = c/d \rightarrow ad = bc$  (cross-multiply) | % Change =  $(\text{new-old})/\text{old} * 100\%$

### Step 1: Solve: $3/x = 6/10$

A)  $x=5$

B)  $x=4$

C)  $x=20$

D)  $x=2$

Answer: A |  $30=6x \rightarrow x=5$

### Step 2: \$40 shirt, 25% off. Sale price?

A) \$30

B) \$32

C) \$35

D) \$10

Answer: A |  $40-10=30$

### Step 3: Population: 200 to 250. % increase?

A) 20%

B) 25%

C) 50%

D) 15%

Answer: B |  $50/200*100=25\%$

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## Q10. [Algebra 1] Graphing & Intercepts

**Key Concepts:** x-intercept: set  $y=0$ , solve for  $x$  | y-intercept: set  $x=0$ , solve for  $y$  | Parallel: equal slopes; Perp:  $m_1 \cdot m_2 = -1$

### Step 1: x-intercept of $3x + 4y = 12$ ?

- A) (4,0)
- B) (0,3)
- C) (3,0)
- D) (0,4)

Answer: A |  $y=0$ :  $3x=12 \rightarrow x=4$

### Step 2: $y=3x+1$ and $y=3x-5$ are...?

- A) Parallel
- B) Perpendicular
- C) Neither
- D) Same line

Answer: A | Same slope  $m=3 \rightarrow$  parallel

### Step 3: Perpendicular to $y=2x+3$ ?

- A)  $y=2x-1$
- B)  $y=-(1/2)x+4$
- C)  $y=(1/2)x+1$
- D)  $y=-2x+3$

Answer: B | Perp slope =  $-1/2$

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### Q11. [Geometry] Pythagorean Theorem

**Key Concepts:**  $a^2 + b^2 = c^2$  (c = hypotenuse) | Common triples: 3-4-5, 5-12-13, 8-15-17

**Step 1: Right triangle: a=5, b=12. Find c.**

- A) 13
- B) 17
- C) 11
- D) 15

Answer: A |  $25+144=169=13^2$

**Step 2: Hyp=10, leg=6. Find missing leg.**

- A) 8
- B) 4
- C)  $\sqrt{136}$
- D) 7

Answer: A |  $a^2=100-36=64 \rightarrow a=8$

**Step 3: Is 7, 24, 25 a right triangle?**

- A) Yes
- B) No
- C) Cannot tell
- D) Need angles

Answer: A |  $7^2+24^2=49+576=625=25^2$

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## Q12. [Geometry] Area & Perimeter

**Key Concepts:** Rectangle:  $A=lw$ ,  $P=2(l+w)$  | Triangle:  $A=(1/2)bh$  | Circle:  $A=\pi r^2$ ,  $C=2\pi r$  | Trapezoid:  $A=(1/2)(b_1+b_2)h$

### Step 1: Area of circle $r=7$ ? ( $\pi=3.14$ )

- A) 153.86
- B) 43.96
- C) 49
- D) 21.98

Answer: A |  $\pi r^2=3.14*49=153.86$

### Step 2: Trapezoid: bases 6,10 height 4.

- A) 32
- B) 24
- C) 40
- D) 16

Answer: A |  $(1/2)(16)(4)=32$

### Step 3: Rectangle $P=36$ , length=10. Width?

- A) 8
- B) 26
- C) 18
- D) 6

Answer: A |  $18=10+w \rightarrow w=8$

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### Q13. [Geometry] Volume & Surface Area

**Key Concepts:** Rect. Prism:  $V=lwh$ ,  $SA=2(lw+lh+wh)$  | Cylinder:  $V=\pi r^2h$  | Sphere:  $V=(4/3)\pi r^3$  | Cube  $SA=6s^2$

#### Step 1: Volume: $l=4$ , $w=3$ , $h=5$

- A) 60
- B) 94
- C) 24
- D) 47

Answer: A |  $4 \cdot 3 \cdot 5 = 60$

#### Step 2: Surface area of cube $s=4$ ?

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

Answer: B |  $6 \cdot 4^2 = 96$

#### Step 3: Volume sphere $r=3$ ? ( $\pi=3.14$ )

- A) 113.04
- B) 37.68
- C) 84.78
- D) 28.27

Answer: A |  $(4/3)(3.14)(27) = 113.04$

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### Q14. [Geometry] Angle Relationships

**Key Concepts:** Complementary: sum=90 deg | Supplementary: sum=180 deg | Vertical angles: equal | Co-interior: sum=180 deg

#### Step 1: Complementary angle of 38 deg?

- A) 52 deg
- B) 142 deg
- C) 62 deg
- D) 48 deg

Answer: A |  $90-38=52$

#### Step 2: Vertical angle of 73 deg?

- A) 107 deg
- B) 73 deg
- C) 17 deg
- D) 37 deg

Answer: B | Vertical angles are equal

#### Step 3: Co-int angles $(3x+10)$ and $(2x+20)$ . Find x.

- A) 30
- B) 28
- C) 25
- D) 150

Answer: A |  $5x+30=180 \rightarrow x=30$

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### Q15. [Geometry] Triangle Congruence

**Key Concepts:** SSS, SAS, ASA, AAS, HL (right triangles) | AAA proves SIMILARITY not congruence!

**Step 1:  $AB=DE$ ,  $BC=EF$ ,  $AC=DF$ . Which rule?**

- A) SSS
- B) SAS
- C) ASA
- D) AAS

Answer: A | All 3 sides equal  $\rightarrow$  SSS

**Step 2: Two sides + included angle equal. Rule?**

- A) SSS
- B) SAS
- C) ASA
- D) AAS

Answer: B | Side-Angle-Side

**Step 3: Which is NOT a congruence theorem?**

- A) SSS
- B) AAA
- C) SAS
- D) ASA

Answer: B | AAA proves similarity only

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**Q16. [Geometry] Circle Theorems**

**Key Concepts:** Central angle = intercepted arc | Inscribed angle =  $(1/2) \cdot \text{arc}$  | Thales: inscribed in semicircle = 90 deg

**Step 1: Central angle 120 deg. Arc?**

- A) 60 deg
- B) 120 deg
- C) 240 deg
- D) 90 deg

Answer: B | Central angle = arc

**Step 2: Inscribed angle, arc=160 deg. Angle?**

- A) 160
- B) 320
- C) 80
- D) 40

Answer: C |  $(1/2) \cdot 160 = 80$

**Step 3: Angle inscribed in semicircle?**

- A) 45 deg
- B) 90 deg
- C) 180 deg
- D) 60 deg

Answer: B | Thales theorem: 90 deg

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## Q17. [Geometry] Transformations

**Key Concepts:** Translation(a,b):  $(x,y) \rightarrow (x+a,y+b)$  | Reflect x-axis:  $(x,y) \rightarrow (x,-y)$  | Reflect y-axis:  $(x,y) \rightarrow (-x,y)$  | Dilation k:  $(x,y) \rightarrow (kx,ky)$

**Step 1: Translate P(2,3) by (-4,5).**

A) (-2,8)

B) (6,-2)

C) (-2,-2)

D) (6,8)

Answer: A |  $(2-4,3+5)=(-2,8)$

**Step 2: Reflect (5,-3) over y-axis.**

A) (5,3)

B) (-5,-3)

C) (-5,3)

D) (3,-5)

Answer: B |  $(-x,y): (-5,-3)$

**Step 3: Dilate (2,4) by factor 3.**

A) (5,7)

B) (6,12)

C)  $(2/3,4/3)$

D) (6,4)

Answer: B | (6,12)

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### Q18. [Geometry] Similar Triangles

**Key Concepts:** AA, SSS~, SAS~ prove similarity | Corresponding sides form equal ratios (scale factor)

**Step 1:  $ABC \sim DEF$ .  $AB=4, DE=8, BC=6$ . Find  $EF$ .**

- A) 12
- B) 3
- C) 10
- D) 16

Answer: A | Scale=2,  $EF=12$

**Step 2: Which does NOT prove similarity?**

- A) AA
- B) SAS~
- C) SSS~
- D) SSA

Answer: D | SSA doesn't prove similarity

**Step 3: 6ft person, 9ft shadow. Tree: 24ft shadow. Height?**

- A) 16 ft
- B) 36 ft
- C) 18 ft
- D) 12 ft

Answer: A |  $6/9 = h/24 \rightarrow h=16$

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**Q19. [Geometry] Coordinate Geometry**

**Key Concepts:** Distance:  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  | Midpoint:  $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$  | Slope:  $m = (y_2 - y_1)/(x_2 - x_1)$

**Step 1: Distance (1,1) to (4,5).**

- A) 5
- B) 4
- C) 7
- D)  $\sqrt{7}$

Answer: A |  $\sqrt{9+16}=5$

**Step 2: Midpoint of (-2,6) and (4,-2).**

- A) (1,2)
- B) (2,4)
- C) (-1,4)
- D) (3,2)

Answer: A | (1,2)

**Step 3: Slope of perp bisector of A(1,2)B(5,6)?**

- A) 1
- B) -1
- C) 4
- D) -4

Answer: B | AB slope=1, perp=-1

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## Q20. [Geometry] Special Right Triangles

**Key Concepts:** 30-60-90: sides  $1:\sqrt{3}:2$  | 45-45-90: sides  $1:1:\sqrt{2}$  | Short leg = hyp/2 in 30-60-90

**Step 1: 30-60-90 triangle, hyp=12. Short leg?**

- A) 6
- C) 4

- B)  $6\sqrt{3}$
- D)  $12\sqrt{3}$

Answer: A | short leg=hyp/2=6

**Step 2: 45-45-90 triangle, hyp= $8\sqrt{2}$ . Leg?**

- A) 8
- C) 4

- B)  $8\sqrt{2}$
- D) 16

Answer: A | leg=hyp/ $\sqrt{2}$ =8

**Step 3: 30-60-90, short leg=4. Long leg?**

- A) 8
- C)  $4\sqrt{2}$

- B)  $4\sqrt{3}$
- D) 2

Answer: B | long leg= $4\sqrt{3}$

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