

Algebra 2 & Geometry

Core Practice Problems – 20 Questions

Print & Study Sheet | Concept Review + Step-by-Step Practice

Name: _____

Date: _____

Score: ____ / 20

ALGEBRA 2 PROBLEMS (1-10)

Problem 1 – Vertex Form & Transformations

Topic: Quadratic Functions | Subject: Algebra 2

KEY CONCEPT

Vertex form: $y = a(x - h)^2 + k$ | Vertex = (h, k)
 $a > 0$ opens up (min = k) | $a < 0$ opens down (max = k)
 $|a| > 1$ narrower | $|a| < 1$ wider

EXAMPLE

Write $y = x^2 - 6x + 11$ in vertex form:

$$y = (x^2 - 6x + 9) + 2 = (x - 3)^2 + 2$$

Vertex = (3, 2), minimum value is 2

Your Question: Given $f(x) = -2(x + 3)^2 + 5$

Q1: What is the vertex of $f(x)$?

A) (3, 5) B) (-3, 5) C) (-3, -5) D) (3, -5)

Answer: B Explanation: In $f(x) = a(x-h)^2+k$, vertex = (h,k). Here $h=-3$, $k=5$.

Work space / Notes:

Q2: Does the parabola open up or down? What is the max/min?

A) Opens up, max=5 B) Opens down, max=5 C) Opens up, min=5 D) Opens down, min=-3

Answer: B Explanation: $a = -2 < 0$ means opens down. $k = 5$ is the maximum.

Work space / Notes:

Q3: What is the axis of symmetry?

A) $x = 5$ B) $x = 3$ C) $x = -3$ D) $x = -5$

Answer: C Explanation: Axis of symmetry passes through vertex x-coordinate: $x = -3$.

Work space / Notes:

Problem 2 – Factoring & Remainder Theorem

Topic: Polynomial Operations | Subject: Algebra 2

KEY CONCEPT

Remainder Theorem: When $f(x)$ divided by $(x-a)$, remainder = $f(a)$

Factor Theorem: $(x-a)$ is a factor if and only if $f(a) = 0$

Difference of squares: $a^2 - b^2 = (a+b)(a-b)$

Sum/Diff of cubes: $a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$

EXAMPLE

Is $(x-2)$ a factor of $f(x) = x^3 - 3x^2 + 4$?

$f(2) = 8 - 12 + 4 = 0$ YES, $(x-2)$ is a factor!

Your Question: Given $f(x) = x^3 + 2x^2 - 5x - 6$

Q1: What is $f(2)$?

A) 0 B) 4 C) -6 D) 8

Answer: A Explanation: $f(2) = 8 + 8 - 10 - 6 = 0$. So $(x-2)$ is a factor!

Work space / Notes:

Q2: Which is a factor of $f(x)$?

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

Answer: C Explanation: Since $f(2)=0$, $(x-2)$ is a factor by the Factor Theorem.

Work space / Notes:

Q3: What is the fully factored form?

A) $(x-2)(x+1)(x-3)$ B) $(x-2)(x+1)(x+3)$ C) $(x+2)(x-1)(x+3)$ D) $(x-2)(x-1)(x+3)$

Answer: B Explanation: $f(x) = (x-2)(x^2+4x+3) = (x-2)(x+1)(x+3)$.

Work space / Notes:

Problem 3 – Rational Functions & Asymptotes

Topic: Rational Expressions | Subject: Algebra 2

KEY CONCEPT

Vertical Asymptote (VA): set denominator = 0

Horizontal Asymptote (HA):

$\text{deg}(\text{num}) < \text{deg}(\text{den}) \rightarrow y = 0$

$\text{deg}(\text{num}) = \text{deg}(\text{den}) \rightarrow y = \text{leading coefficient ratio}$

$\text{deg}(\text{num}) > \text{deg}(\text{den}) \rightarrow \text{no HA}$

EXAMPLE

$$f(x) = (2x+1)/(x-3)$$

VA: $x = 3$ | HA: both degree 1 $\rightarrow y = 2/1 = 2$

Your Question: Analyze: $f(x) = (3x^2 + 1) / (x^2 - 4)$

Q1: What are the vertical asymptotes?

A) $x=4$ only B) $x=1$ only C) $x=0$ only D) $x=2$ and $x=-2$

Answer: D Explanation: $x^2 - 4 = 0 \rightarrow x = +/-2$. VAs are $x=2$ and $x=-2$.

Work space / Notes:

Q2: What is the horizontal asymptote?

A) $y=0$ B) $y=3$ C) $y=-4$ D) No HA

Answer: B Explanation: Both degree 2 $\rightarrow \text{HA} = 3/1 = 3$.

Work space / Notes:

Q3: What is the y-intercept?

A) $y=3$ B) $y=0$ C) $y=-1/4$ D) $y=4$

Answer: C Explanation: $f(0) = 1/(-4) = -1/4$.

Work space / Notes:

Problem 4 – Log Properties & Equations

Topic: Exponential & Logarithmic | Subject: Algebra 2

KEY CONCEPT

$$\log(ab) = \log a + \log b$$

$$\log(a/b) = \log a - \log b$$

$$\log(a^n) = n \cdot \log a$$

$$\text{Change of base: } \log_b(a) = \frac{\ln(a)}{\ln(b)}$$

$$\text{Inverse: } \log_b(b^x) = x \text{ and } b^{(\log_b x)} = x$$

EXAMPLE

$$\text{Solve: } \log_2(x) + \log_2(x-2) = 3$$

$$\log_2(x(x-2)) = 3 \rightarrow x(x-2) = 8 \rightarrow x^2 - 2x - 8 = 0$$

$$(x-4)(x+2) = 0 \rightarrow x = 4 \text{ (reject } x = -2 \text{ since } x > 0)$$

Your Question: Solve logarithmic equations.

Q1: What is $\log_3(81)$?

A) 4 B) 3 C) 9 D) 27

Answer: A Explanation: $3^4 = 81$, so $\log_3(81) = 4$.

Work space / Notes:

Q2: Expand: $\log_2(8x^3)$

A) $3 + \log_2(x)$ B) $8 + 3\log_2(x)$ C) $3 + 3\log_2(x)$ D) $3\log_2(8x)$

Answer: C Explanation: $\log_2(8) + \log_2(x^3) = 3 + 3\log_2(x)$.

Work space / Notes:

Q3: Solve: $2^{(x+1)} = 32$

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

Answer: B Explanation: $32 = 2^5$, so $x+1=5$, $x=4$.

Work space / Notes:

Problem 5 – Nonlinear Systems

Topic: Systems of Equations | Subject: Algebra 2

KEY CONCEPT

Nonlinear system (line + parabola): use substitution

Discriminant b^2-4ac :

> 0 two solutions

$= 0$ one solution

< 0 no real solutions

EXAMPLE

Solve: $y = x^2$ and $y = x + 2$

$x^2 = x+2 \rightarrow x^2-x-2=0 \rightarrow (x-2)(x+1)=0$

Solutions: $(2,4)$ and $(-1,1)$

Your Question: Solve: $y = x^2 - 3$ and $y = 2x - 1$

Q1: Setting up: substitute to get?

A) $x^2-2x-2=0$ B) $x^2+2x+2=0$ C) $x^2-2x+3=0$ D) $x^2+2x-1=0$

Answer: A Explanation: $x^2-3 = 2x-1 \rightarrow x^2-2x-2=0$.

Work space / Notes:

Q2: What is the discriminant?

A) 4 B) 0 C) 12 D) -4

Answer: C Explanation: $b^2-4ac = 4+8 = 12$.

Work space / Notes:

Q3: How many intersection points?

A) None B) Two C) One D) Infinite

Answer: B Explanation: Discriminant = $12 > 0$, so two real solutions.

Work space / Notes:

Problem 6 – Operations with Complex Numbers

Topic: Complex Numbers | Subject: Algebra 2

KEY CONCEPT

$$i = \sqrt{-1}, i^2 = -1, i^3 = -i, i^4 = 1$$

$$\text{Add: } (a+bi) + (c+di) = (a+c) + (b+d)i$$

$$\text{Multiply: } (a+bi)(c+di) = (ac-bd) + (ad+bc)i$$

$$\text{Conjugate: } a+bi \rightarrow a-bi$$

$$\text{Modulus: } |z| = \sqrt{a^2 + b^2}$$

EXAMPLE

$$(3+2i)(1-i) = 3-3i+2i-2i^2 = 3-i+2 = 5-i$$

Your Question: Work with complex numbers.

Q1: What is i^{25} ?

A) 1 B) -1 C) -i D) i

Answer: D Explanation: i cycles every 4. $25 = 4 \times 6 + 1$, so $i^{25} = i$.

Work space / Notes:

Q2: Compute $(2+3i)(2-3i)$:

A) $4-9i$ B) 13 C) $4+9$ D) -5

Answer: B Explanation: $(a+bi)(a-bi) = a^2 + b^2 = 4 + 9 = 13$.

Work space / Notes:

Q3: Modulus of $z = 3+4i$?

A) 5 B) 7 C) $\sqrt{7}$ D) 25

Answer: A Explanation: $|z| = \sqrt{9+16} = \sqrt{25} = 5$.

Work space / Notes:

Problem 7 – Arithmetic & Geometric Series

Topic: Sequences & Series | Subject: Algebra 2

KEY CONCEPT

Arithmetic: $a_n = a_1 + (n-1)d$

$S_n = n/2 * (a_1 + a_n)$

Geometric: $a_n = a_1 * r^{(n-1)}$

$S_n = a_1 * (1-r^n)/(1-r)$

Infinite geometric ($|r| < 1$): $S_{\infty} = a_1/(1-r)$

EXAMPLE

Arithmetic 2,5,8,11,... $d=3$

$S_{10} = 10/2 * (2+29) = 5*31 = 155$

Your Question: Analyze sequences and series.

Q1: 8th term of: 3, 7, 11, 15,...?

A) 27 B) 29 C) 31 D) 33

Answer: C Explanation: $a_1=3, d=4. a_8 = 3+7(4) = 31.$

Work space / Notes:

Q2: Sum of first 6 terms of: 2, 6, 18,...?

A) 728 B) 364 C) 243 D) 486

Answer: A Explanation: $r=3. S_6 = 2(1-729)/(1-3) = 728.$

Work space / Notes:

Q3: Infinite sum of: 8, 4, 2, 1,...?

A) 8 B) 16 C) 4 D) 32

Answer: B Explanation: $r=1/2. S_{\infty} = 8/(1-1/2) = 16.$

Work space / Notes:

Problem 8 – Simplifying Radical Expressions

Topic: Radical & Rational Exponents | Subject: Algebra 2

KEY CONCEPT

$$a^{(m/n)} = \text{nth_root}(a^m)$$

$$a^{(1/2)} = \text{sqrt}(a), a^{(1/3)} = \text{cube_root}(a)$$

$$\text{sqrt}(ab) = \text{sqrt}(a) \cdot \text{sqrt}(b)$$

Rationalize: multiply by conjugate to clear denominator

EXAMPLE

$$\text{sqrt}(75) = \text{sqrt}(25 \cdot 3) = 5 \cdot \text{sqrt}(3)$$

$$\text{Rationalize } 1/\text{sqrt}(3) = \text{sqrt}(3)/3$$

Your Question: Simplify radical expressions.

Q1: Simplify $\text{sqrt}(48)$:

A) $4 \cdot \text{sqrt}(3)$ B) $2 \cdot \text{sqrt}(12)$ C) $6 \cdot \text{sqrt}(2)$ D) $8 \cdot \text{sqrt}(3)$

Answer: A Explanation: $\text{sqrt}(48) = \text{sqrt}(16 \cdot 3) = 4 \cdot \text{sqrt}(3)$.

Work space / Notes:

Q2: Evaluate $27^{(2/3)}$:

A) 3 B) 6 C) 9 D) 18

Answer: C Explanation: $(\text{cube_root}(27))^2 = 3^2 = 9$.

Work space / Notes:

Q3: Rationalize $5/(2+\text{sqrt}(3))$:

A) $5(2+\text{sqrt}(3))$ B) $10-5 \cdot \text{sqrt}(3)$ C) $5(2-\text{sqrt}(3))/4$ D) $10+5 \cdot \text{sqrt}(3)$

Answer: B Explanation: Multiply by $(2-\text{sqrt}(3))$: $5(2-\text{sqrt}(3))/(4-3) = 10-5 \cdot \text{sqrt}(3)$.

Work space / Notes:

Problem 9 – Circles & Parabolas

Topic: Conic Sections | Subject: Algebra 2

KEY CONCEPT

Circle: $(x-h)^2 + (y-k)^2 = r^2$, center (h,k) , radius r

Parabola (vertical): $(x-h)^2 = 4p(y-k)$

Parabola (horizontal): $(y-k)^2 = 4p(x-h)$

p = distance from vertex to focus

EXAMPLE

$$x^2 + y^2 + 4x - 6y + 4 = 0$$

$$(x+2)^2 + (y-3)^2 = 9$$

Center $(-2,3)$, radius 3

Your Question: Analyze conic sections.

Q1: Center and radius of $x^2 + y^2 - 6x + 2y - 6 = 0$?

A) $(3,-1), r=4$ B) $(-3,1), r=4$ C) $(3,-1), r=16$ D) $(-3,1), r=16$

Answer: A Explanation: $(x-3)^2 + (y+1)^2 = 16$. Center $(3,-1)$, $r=4$.

Work space / Notes:

Q2: Circle with center $(2,-3)$, radius 5?

A) $(x-2)^2 + (y+3)^2 = 5$ B) $(x+2)^2 + (y-3)^2 = 25$

C) $(x-2)^2 + (y+3)^2 = 25$ D) $(x-2)^2 + (y-3)^2 = 25$

Answer: C Explanation: $(x-2)^2 + (y+3)^2 = 25$.

Work space / Notes:

Q3: Does $(5,3)$ lie inside, on, or outside $(x-2)^2 + (y-1)^2 = 16$?

A) Outside B) On the circle C) Inside D) Cannot determine

Answer: C Explanation: $(5-2)^2 + (3-1)^2 = 9 + 4 = 13 < 16$. Point is INSIDE.

Work space / Notes:

Problem 10 – Combinations & Probability

Topic: Probability | Subject: Algebra 2

KEY CONCEPT

$C(n,r) = n!/(r!(n-r)!)$ [order doesn't matter]

$P(n,r) = n!/(n-r)!$ [order matters]

$P(A) = \text{favorable}/\text{total}$

$P(A \text{ and } B) = P(A) \cdot P(B)$ [independent]

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

EXAMPLE

Choose 3 from 7: $C(7,3) = 35$ ways

Your Question: Solve probability and counting problems.

Q1: Choose 2 cards from 5 different cards: how many ways?

A) 20 B) 10 C) 5 D) 25

Answer: B Explanation: $C(5,2) = 10$.

Work space / Notes:

Q2: $P(\text{likes math}) = 0.6$. What is $P(\text{not liking math})$?

A) 0.4 B) 0.6 C) 0.3 D) 0.24

Answer: A Explanation: $P(\text{not } A) = 1 - 0.6 = 0.4$.

Work space / Notes:

Q3: Roll two dice. $P(\text{both show } 3)$?

A) $1/6$ B) $2/36$ C) $1/36$ D) $1/12$

Answer: C Explanation: $(1/6)(1/6) = 1/36$.

Work space / Notes:

Problem 11 – Triangle Congruence Theorems

Topic: Triangle Congruence | Subject: Geometry

KEY CONCEPT

SSS – Side-Side-Side

SAS – Side-Angle-Side

ASA – Angle-Side-Angle

AAS – Angle-Angle-Side

HL – Hypotenuse-Leg (right triangles only)

Note: AAA and SSA are NOT valid congruence shortcuts!

EXAMPLE

Two triangles share a common side. Look at what other info you have to determine which theorem applies.

Your Question: Identify triangle congruence theorems.

Q1: Three pairs of equal sides. Which theorem proves congruence?

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

Answer: A Explanation: All three sides equal -> SSS.

Work space / Notes:

Q2: Which is NOT a valid congruence theorem?

A) ASA B) SAS C) SSA D) AAS

Answer: C Explanation: SSA (Side-Side-Angle) does NOT guarantee congruence.

Work space / Notes:

Q3: Right triangles with equal hypotenuse and one leg. Which theorem?

A) SSS B) SAS C) ASA D) HL

Answer: D Explanation: HL (Hypotenuse-Leg) applies to right triangles.

Work space / Notes:

Problem 12 – Parallel Lines & Angle Pairs

Topic: Parallel Lines | Subject: Geometry

KEY CONCEPT

Parallel lines cut by transversal:

Corresponding angles = equal

Alternate interior angles = equal

Alternate exterior angles = equal

Co-interior (same-side interior) = supplementary (180 degrees)

EXAMPLE

Parallel lines, transversal creates 65 degree angle.

Alternate interior = 65 deg, Co-interior = 115 deg

Your Question: Solve angle problems with parallel lines.

Q1: Parallel lines, corresponding angle to 72 degrees is?

A) 108 deg B) 72 deg C) 18 deg D) 180 deg

Answer: B Explanation: Corresponding angles are equal: 72 degrees.

Work space / Notes:

Q2: Co-interior angles are $3x$ and $(x+40)$. Find x .

A) 35 B) 40 C) 45 D) 30

Answer: A Explanation: $3x+x+40=180 \rightarrow 4x=140 \rightarrow x=35$.

Work space / Notes:

Q3: Alternate exterior angles in parallel lines are:

A) Supplementary B) Complementary C) Equal D) All 90 deg

Answer: C Explanation: Alternate exterior angles are always equal (congruent).

Work space / Notes:

Problem 13 – Similarity & Proportions

Topic: Similar Triangles | Subject: Geometry

KEY CONCEPT

AA – Two equal angles -> similar

SAS~ – Two proportional sides + included angle equal

SSS~ – All three sides in same ratio

Scale factor k: sides ratio = k

Area ratio = k^2

Volume ratio = k^3

EXAMPLE

Two triangles with all angles 40, 60, 80 degrees are always similar (AA).

Your Question: Solve similarity problems.

Q1: Scale factor 3:5. One side = 12. Find corresponding side.

A) 15 B) 20 C) 18 D) 25

Answer: B Explanation: $12/x = 3/5 \rightarrow x = 20$.

Work space / Notes:

Q2: Scale factor 2:3. Ratio of areas?

A) 2:3 B) 3:4 C) 4:9 D) 8:27

Answer: C Explanation: Area ratio = (scale factor)² = 4:9.

Work space / Notes:

Q3: AA similarity requires:

A) Two pairs of equal angles B) Three pairs of equal angles

C) Two pairs of equal sides D) All sides proportional

Answer: A Explanation: Only TWO pairs of equal angles needed (third follows automatically).

Work space / Notes:

Problem 14 – Pythagorean Theorem & Trigonometry

Topic: Right Triangles | Subject: Geometry

KEY CONCEPT

$$a^2 + b^2 = c^2 \text{ (c = hypotenuse)}$$

SOH-CAH-TOA:

$$\sin(\theta) = \text{opposite} / \text{hypotenuse}$$

$$\cos(\theta) = \text{adjacent} / \text{hypotenuse}$$

$$\tan(\theta) = \text{opposite} / \text{adjacent}$$

30-60-90 sides: $x, x\sqrt{3}, 2x$

45-45-90 sides: $x, x, x\sqrt{2}$

EXAMPLE

Legs 5 and 12: $\text{hyp} = \sqrt{169} = 13$

$\sin(\theta) = 5/13$ if $\text{opp}=5, \text{hyp}=13$

Your Question: Solve right triangle problems.

Q1: 30-60-90 triangle, shorter leg = 7. Find hypotenuse.

A) 14 B) $7\sqrt{3}$ C) $7\sqrt{2}$ D) 21

Answer: A Explanation: Hypotenuse = $2 * \text{shorter leg} = 2(7) = 14$.

Work space / Notes:

Q2: $\sin(\theta) = 3/5$. Find $\cos(\theta)$.

A) $3/4$ B) $4/5$ C) $5/4$ D) $5/3$

Answer: B Explanation: $\cos^2 = 1 - 9/25 = 16/25$. $\cos = 4/5$.

Work space / Notes:

Q3: Legs 8 and 15. \tan of angle opposite leg of length 8?

A) $8/17$ B) $15/17$ C) $8/15$ D) $15/8$

Answer: C Explanation: $\tan = \text{opposite/adjacent} = 8/15$.

Work space / Notes:

Problem 15 – Circle Theorems & Arc Length

Topic: Circles | Subject: Geometry

KEY CONCEPT

Arc Length: $L = (\theta/360) * 2\pi*r$

Sector Area: $A = (\theta/360) * \pi*r^2$

Inscribed Angle = $(1/2) * \text{intercepted arc}$

Tangent perpendicular to radius at point of tangency

Intersecting chords: $a*b = c*d$

EXAMPLE

Circle $r=10$, central angle 120 degrees:

Arc = $(120/360)*2*\pi*10 = 20*\pi/3$

Your Question: Solve circle geometry problems.

Q1: Circle $r=6$, central angle 90 degrees. Arc length?

A) $6*\pi$ B) $3*\pi$ C) $9*\pi$ D) $12*\pi$

Answer: B Explanation: $L = (90/360)*2*\pi*6 = (1/4)*12*\pi = 3*\pi$.

Work space / Notes:

Q2: Inscribed angle intercepts 80-degree arc. Angle measure?

A) 40 deg B) 80 deg C) 160 deg D) 20 deg

Answer: A Explanation: Inscribed angle = $(1/2)*80 = 40$ degrees.

Work space / Notes:

Q3: Chords intersect: one divided into 4 and 6. Other part = 3. Find missing part.

A) 6 B) 7 C) 8 D) 9

Answer: C Explanation: $4*6 = 3*x \rightarrow x = 8$.

Work space / Notes:

Problem 16 – 3D Solids – Surface Area & Volume

Topic: Area & Volume | Subject: Geometry

KEY CONCEPT

Prism/Cylinder: $V = B \cdot h$

Pyramid/Cone: $V = (1/3) \cdot B \cdot h$

Sphere: $V = (4/3) \cdot \pi \cdot r^3$, $SA = 4 \cdot \pi \cdot r^2$

Cylinder SA: $2 \cdot \pi \cdot r^2 + 2 \cdot \pi \cdot r \cdot h$

Cone SA: $\pi \cdot r^2 + \pi \cdot r \cdot l$ (l = slant height)

EXAMPLE

Cylinder $r=3$, $h=5$: $V = 45 \cdot \pi$, $SA = 48 \cdot \pi$

Your Question: Compute surface area and volume.

Q1: Sphere radius 3. Volume?

A) $9 \cdot \pi$ B) $27 \cdot \pi$ C) $36 \cdot \pi$ D) $12 \cdot \pi$

Answer: C Explanation: $V = (4/3) \cdot \pi \cdot 27 = 36 \cdot \pi$.

Work space / Notes:

Q2: Cone $r=4$, $h=3$. Volume?

A) $16 \cdot \pi$ B) $48 \cdot \pi$ C) $12 \cdot \pi$ D) $64 \cdot \pi$

Answer: A Explanation: $V = (1/3) \cdot \pi \cdot 16 \cdot 3 = 16 \cdot \pi$.

Work space / Notes:

Q3: Rectangular prism $3 \times 4 \times 5$. Surface area?

A) 60 B) 94 C) 120 D) 47

Answer: B Explanation: $SA = 2(12+15+20) = 2(47) = 94$.

Work space / Notes:

Problem 17 – Distance, Midpoint & Slope

Topic: Coordinate Geometry | Subject: Geometry

KEY CONCEPT

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: $m = (y_2-y_1)/(x_2-x_1)$

Parallel: $m_1 = m_2$

Perpendicular: $m_1 * m_2 = -1$

EXAMPLE

$A(1,2) B(5,6)$: $dist = 4*\sqrt{2}$, $mid=(3,4)$, $slope=1$

Your Question: Use coordinate geometry formulas.

Q1: Distance between A(-1,3) and B(3,0)?

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

Answer: A Explanation: $\sqrt{16+9} = \sqrt{25} = 5$.

Work space / Notes:

Q2: Midpoint of (2,8) and (6,2)?

A) (3,5) B) (8,10) C) (4,5) D) (2,4)

Answer: C Explanation: $((2+6)/2, (8+2)/2) = (4,5)$.

Work space / Notes:

Q3: Slope = 2/3. Perpendicular slope?

A) 2/3 B) -3/2 C) 3/2 D) -2/3

Answer: B Explanation: Perpendicular = negative reciprocal = -3/2.

Work space / Notes:

Problem 18 – Reflections, Rotations & Translations

Topic: Transformations | Subject: Geometry

KEY CONCEPT

Translation: $(x,y) \rightarrow (x+a, y+b)$

Reflection over x-axis: $(x,y) \rightarrow (x,-y)$

Reflection over y-axis: $(x,y) \rightarrow (-x,y)$

Reflection over $y=x$: $(x,y) \rightarrow (y,x)$

Rotation 90 deg CCW: $(x,y) \rightarrow (-y,x)$

Rotation 180 deg: $(x,y) \rightarrow (-x,-y)$

EXAMPLE

Reflect $(3,-2)$ over x-axis: $(3,2)$

Rotate 90 CCW: $(3,-2) \rightarrow (2,3)$

Your Question: Apply geometric transformations.

Q1: Reflect $(-3,4)$ over y-axis:

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

Answer: A Explanation: $(x,y) \rightarrow (-x,y)$. $(-3,4) \rightarrow (3,4)$.

Work space / Notes:

Q2: Rotate $(2,5)$ by 90 deg counter-clockwise:

A) $(5,2)$ B) $(-5,2)$ C) $(-2,-5)$ D) $(5,-2)$

Answer: B Explanation: $(x,y) \rightarrow (-y,x)$. $(2,5) \rightarrow (-5,2)$.

Work space / Notes:

Q3: Translate $(4,-1)$ by vector $\langle -2, 3 \rangle$:

A) $(6,2)$ B) $(-6,-4)$ C) $(2,2)$ D) $(-2,4)$

Answer: C Explanation: $(4+(-2), -1+3) = (2,2)$.

Work space / Notes:

Problem 19 – Properties of Special Quadrilaterals

Topic: Quadrilaterals | Subject: Geometry

KEY CONCEPT

Parallelogram: opp sides parallel & equal; diagonals bisect each other

Rectangle: parallelogram + 4 right angles; diagonals equal

Rhombus: parallelogram + 4 equal sides; diagonals perpendicular

Square: rectangle + rhombus

Trapezoid midsegment = $(\text{base1} + \text{base2})/2$

EXAMPLE

Parallelogram diagonals 10 and 8: each bisected to 5 and 4.

Your Question: Identify quadrilateral properties.

Q1: In a rhombus, diagonals are:

A) Equal in length B) Parallel C) Perpendicular bisectors of each other D) All sides equal

Answer: C Explanation: Rhombus diagonals are perpendicular bisectors of each other.

Work space / Notes:

Q2: Trapezoid bases 6 and 14. Midsegment length?

A) 8 B) 10 C) 20 D) 6

Answer: B Explanation: $(6+14)/2 = 10$.

Work space / Notes:

Q3: Which quadrilateral has BOTH equal AND perpendicular diagonals?

A) Square B) Rhombus C) Rectangle D) Parallelogram

Answer: A Explanation: Only SQUARE has both equal diagonals (like rectangle) AND perpendicular diagonals (like rhombus).

Work space / Notes:

Problem 20 – Angle Relationships & Proofs

Topic: Geometric Proofs | Subject: Geometry

KEY CONCEPT

Triangle angle sum = 180 degrees

Exterior angle = sum of two non-adjacent interior angles

Polygon interior angle sum = $(n-2)*180$ degrees

Regular polygon interior angle = $(n-2)*180/n$

Linear pair = supplementary (sum = 180 degrees)

EXAMPLE

Regular hexagon: interior angle = $(6-2)*180/6 = 120$ degrees

Your Question: Apply angle theorems.

Q1: Sum of interior angles of a pentagon?

A) 360 deg B) 540 deg C) 720 deg D) 900 deg

Answer: B Explanation: $(5-2)*180 = 540$ degrees.

Work space / Notes:

Q2: Interior angle of a regular octagon?

A) 120 deg B) 150 deg C) 135 deg D) 160 deg

Answer: C Explanation: $(8-2)*180/8 = 135$ degrees.

Work space / Notes:

Q3: Triangle: 48 and 73 degrees. Exterior angle at third vertex?

A) 121 deg B) 59 deg C) 180 deg D) 107 deg

Answer: A Explanation: Third angle = $180-48-73 = 59$. Exterior = $180-59 = 121 = 48+73$.

Work space / Notes: