A Message from the Authors:

Thank you for downloading our free product! These problem pages with their corresponding solutions will provide you with a sample of the products available for digital download on Teachers Pay Teachers (9 sets of 10 problem pages each plus 3 bundles: Sets 1 – 5, Sets 6 – 9, or the full collection!). This free sample includes 5 pages of problems with their corresponding solutions (15 problems total with detailed solutions).

Our multiple choice math warm-ups were designed to be used on a daily basis to review and reinforce fundamental math skills AND prepare students for standardized tests. The detailed easy-to-understand solutions can be used to revise or completely reteach essential skills. Developed by two certified high school math teachers based on their students' needs, these exercises offer a mixed review of math concepts & processes, similar to many standardized tests.

This sample and these problem sets are ideal for high school teachers as daily math warm-ups (bell ringers, bell work, etc.) and are essential for 11th and 12th grade math teachers to expose problem areas and fill in the gaps. Exercises are appropriate for students in Algebra 2 and Precalculus, but problems can also be used as enrichment for students in Algebra 1 and Geometry.

Key features of each problem set include:

- **Multiple choice format** based on the design of numerous standardized tests
- Topics addressed in a random order similar to most standardized tests
- Three levels of difficulty on each page (easy, moderate and hard but not in the same order on each page) with problems increasing in difficulty across all 9 sets
- **Detailed easy-to-follow solutions** for every question (written specifically for students to develop or reinforce their understanding of basic mathematical and algebraic processes and to expose and correct students' errors)
- Common Core State Standards for Mathematics listed for each problem
- Most appropriate Mathematical Practice from the Common Core Standards noted for each problem (although more than one practice often applies)

We hope that you find our products beneficial! We encourage you to use these math warm-ups to engage your students at the bell, revisit critical math skills and teach test-taking strategies in the first 5 minutes of class! We feel that continual daily review of these concepts during the school year will allow students to build confidence and competence in their understanding of mathematics, gaining the momentum necessary to succeed in your math classroom! Enrich your curriculum with this supplement!

We would love to have your feedback on this product so that we may better serve you! Follow us on TpT and on Facebook or visit our website: mathmomentum.com!!

Rachel Gelderman & Susan West

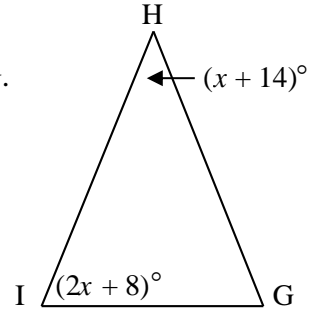**Common Core Standard**: 4.G.2, 7.EE.4, G-CO.10
Mathematical Practice: *Make sense of problems and persevere in solving them.*

1. Triangle GHI is an isosceles triangle with base IG. If the measure of
    ∠H = x + 14 and the measure of ∠I = 2x + 8, find the measure of ∠G.

    A   80°

    B   68°

    C   44°

    D   30°

H

$(x + 14)°$

I $(2x + 8)°$ G

Common Core Standard: 5.G.1, 6.EE.6, 8.F.3
Mathematical Practice: *Reason abstractly and quantitatively.*

2. A line passes through the points (4, 9) and (5, -3). Find the equation of the line.

    A $y = -12x + 57$

    B $y = 12x - 39$

    C $y = -6x + 33$

    D $y = 6x - 15$

Common Core Standard: 5.NBT.7
Mathematical Practice: *Make sense of problems and persevere in solving them.*

3. Jack buys three CD's for $11.99 each, including tax. If he has $40, how much change should
    Jack receive?

    A $75.97

    B $51.99

    C $28.01

    D $4.03

1. **(B)** Because $\triangle GHI$ is isosceles, base angles are equal which means that $\angle I \cong \angle G = 2x + 8$. Recall that the sum of the angles of a triangle is 180 degrees and produce the equation:

$$2(2x + 8) + (x + 14) = 180$$

Distribute:	$4x + 16 + x + 14 = 180$
Combine like terms:	$5x + 30 = 180$
Subtract 30 from both sides:	$5x = 150$
Divide both sides by 5:	$x = 30$

Substitute that value into the expression for $\angle G$. So $2x + 8 = 2(30) + 8 = 68$. Therefore, $\angle G$ measures $68°$.

2. **(A)** To write the equation of a line, begin by finding the slope. Use the slope formula where (x_1, y_1) and (x_2, y_2) are points on the line:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substitute coordinates:	$m = \dfrac{9 - (-3)}{4 - 5}$
Simplify:	$m = \dfrac{12}{-1} = -12$

Choose one of the given points and substitute the slope and point into the point-slope formula:

$$(y - y_1) = m(x - x_1)$$

Substitute:	$(y - 9) = -12(x - 4)$
Distribute:	$y - 9 = -12x + 48$
Add 9 to both sides:	$y = -12x + 57$

3. **(D)** To find the total cost of the CD's, multiply $11.99 by three which equals $35.97. To find the amount of change he should receive, subtract the cost from $40 (the money that Jack has). Jack will receive $4.03 in change.

Solutions to Page 2

Common Core Standard: 6.EE.3, 8.EE.1, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*
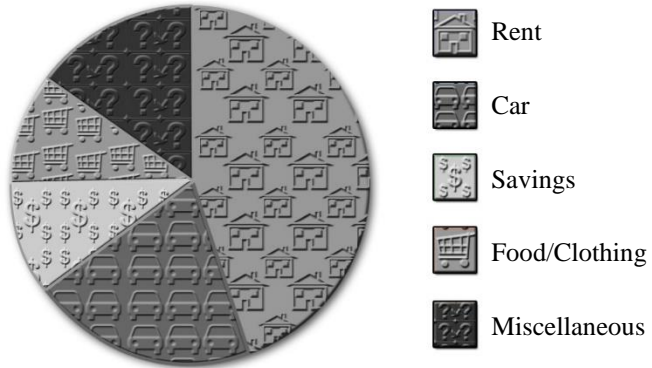
1. Simplify: $(x^2)^3 \cdot 2x^4 \cdot (3x)^2$

   A $5x^{11}$

   B $6x^{11}$

   C $18x^{12}$

   D $12x^{48}$

Common Core Standard: 6.SP.4, 7.EE.3
Mathematical Practice: *Look for and make use of structure.*

2. Juanita earns $2200 per month. The circle graph represents her monthly budget. Approximately how much money does Juanita spend on her car payment?

   A $220

   B $440

   C $550

   D $1000

Rent

Car

Savings

Food/Clothing

Miscellaneous

Common Core Standard: 6.EE.2.c, 6.G.4, 7.G.6
Mathematical Practice: *Model with mathematics.*

3. Anton built a big square sandbox with a cover. He wants to paint the sides and lid green. One small can of green paint covers 100 square feet. The sandbox measures 8 feet on a side, and the sides are 1 foot high. Which of the following choices best describes this situation?

   A One can of paint should be exactly enough to cover the sides and lid (no paint left over).

   B One can of paint should be more than enough to cover the sides and lid (some left over).

   C One can is not enough. Anton will need to buy two cans.

   D There is not enough information given to determine the number of paint cans needed.

1. **(C)** To simplify this expression, follow the order of operations (parentheses, exponents, multiplication/division, addition/subtraction). There is no simplifying to do within the parentheses, so next simplify expressions with exponents. When raising a power to a power, multiply the exponents, so $(x^2)^3$ becomes x^6. $(3x)^2$ contains a product within the parentheses. The exponent 2 applies to both 3 and x: $(3x)^2 = 3^2 x^2 = 9x^2$. At this point, there are no parentheses left. Just multiply the three monomials together (add exponents). The original expression has been simplified as follows:

$$(x^2)^3 \bullet 2x^4 \bullet (3x)^2$$
$$= x^6 \bullet 2x^4 \bullet 9x^2$$

Multiply (add exponents): $\qquad = 18x^{12}$

2. **(B)** Looking at the graph, it appears that the car payment sector is slightly less than 25% since the central angle is not quite a right angle (25% would be a quarter of the circle yielding a 90° angle at the center). 25% of Juanita's monthly earnings can be found by multiplying $(0.25)(\$2200) = \$550$. But since the car payment sector is slightly less than 25%, her car payment must be less than \$550. \$440 is a reasonable choice, representing 20% of her income. \$220 is too low, as it is only 10% of her total monthly earnings. The car payment sector on the graph is certainly larger than 10%. The best approximation is \$440.

Rent

Car

Savings

Food/Clothing

Miscellaneous
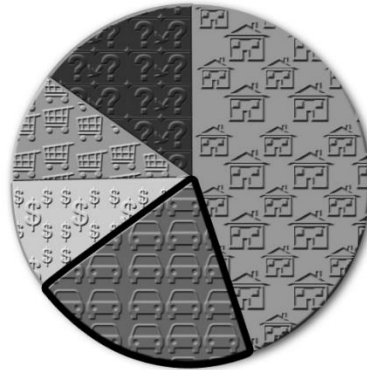
3. **(B)** Anton must cover five surfaces with paint: the four sides (each measuring 8 feet long by 1 foot high) and the square lid (measuring 8 feet by 8 feet). The total surface area can be found by finding the sum of the areas of the five surfaces. Since the four sides are each rectangles, find the area of a side by using the formula $A = lw$. In this case, $l = 8$ and $w = 1$, so the area can be found as follows:

$$A = lw$$
$$A = 8 \text{ ft} \bullet 1 \text{ ft}$$
$$A = 8 \text{ ft}^2$$

There are four of these rectangles so the total area for the sides is $4 \bullet 8 \text{ ft}^2 = 32 \text{ ft}^2$. The lid is a square which is also a rectangle, so the same formula applies. For the square lid, both l and w are 8 feet. Using these measurements, find the lid area as follows:

$$A = lw$$
$$A = 8 \text{ ft} \bullet 8 \text{ ft}$$
$$A = 64 \text{ ft}^2$$

The total surface area of the five surfaces of the sandbox is $32 \text{ ft}^2 + 64 \text{ ft}^2 = 96 \text{ ft}^2$. If Anton buys a can of paint that covers 100 ft^2, there should be more than enough paint to cover the sides and lid of the sandbox.
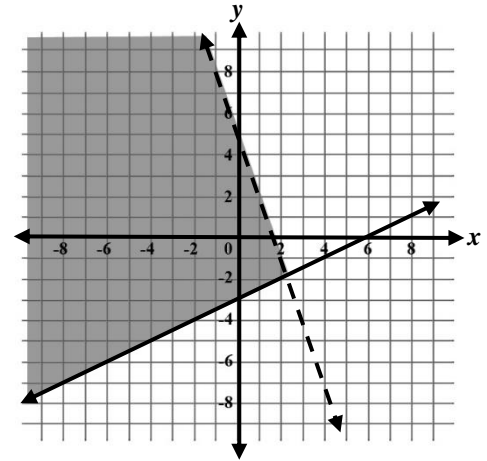
Solutions to Page 16

Common Core Standard: A-REI.12
Mathematical Practice: *Look for and make use of structure.*

1. Which of the following points is a solution to the system of inequalities shown on the graph?

   A (0, -8)

   B (1, 2)

   C (-2, -5)

   D (-10, 4)

Common Core Standard: 8.F.5, F-IF.4
Mathematical Practice: *Look for and make use of structure.*

2. While vacationing in the mountains, Linda decides to go on a hot air balloon ride. The graph at right shows the altitude of her flight (in feet) over time (in minutes). The maximum point on the graph represents which of the following situations?

   A The balloon lands on the ground after 80 minutes.

   B The balloon reaches a maximum height of 1250 feet after 80 minutes.

   C The balloon reaches a maximum height of 1250 feet after 40 minutes.

   D The balloon reaches a maximum height of 1500 feet after 40 minutes.
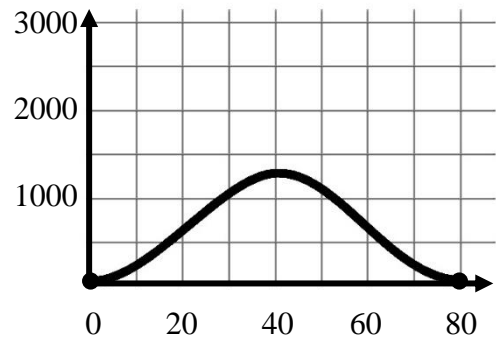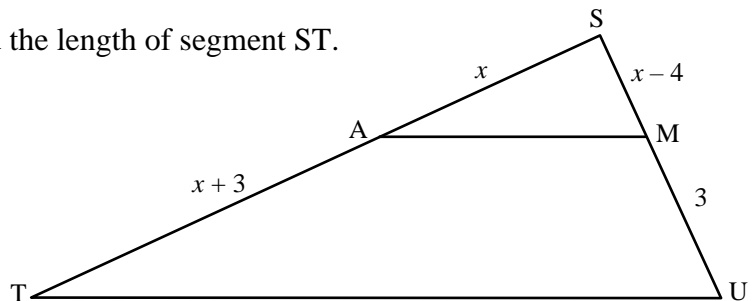
Common Core Standard: A-CED.1, A-REI.4.b, G-SRT.2, G-SRT.4
**Mathematical Practice**: *Make sense of problems and persevere in solving them.*

3. Segment AM is parallel to TU. Find the length of segment ST.

   A -5

   B 6

   C $3 + 4\sqrt{3}$

   D 15

Page 45

1. **(D)** For an ordered pair to be a solution to a system of inequalities, it must appear within the shaded region of the graph or on a solid line boundary of the shaded region. Check each of the choices to determine whether it is a solution. Choice A (0, -8), on the *y*-axis, does not fall within the shaded area. Choice B (1, 2), in the first quadrant, falls on the dotted line bordering the shaded region. However points on the dotted line are not part of the solution set, so choice B is not correct. Choice C (-2, -5), in the third quadrant, is located just outside of the shaded area. Choice D (-10, 4) is located in the second quadrant beyond the given graph, but recall that the lines and shading in the coordinate plane all extend infinitely. If the graph were redrawn to include the point (-10, 4), it would fall within the shaded region. Choice D is the correct answer.

2. **(C)** The maximum point of a graph is vertically the "highest" point, so look for this point on the given graph. It is right in the middle. In this situation, the altitude of the balloon depends on the amount of time that has passed since the balloon left the ground, making altitude the dependent variable (*y*) and time the independent variable (*x*). Clearly the *x*-coordinate of the maximum is 40 minutes. The *y*-coordinate falls half way between 1000 and 1500 ft. at about 1250 ft. So in this situation, the maximum point (40 min., 1250 ft.) indicates that the balloon reaches its maximum altitude of 1250 feet after 40 minutes.

3. **(D)** Since AM ∥ TU, there are two sets of corresponding angles: ∠SAM ≅ ∠STU and ∠SMA ≅ ∠SUT (recall corresponding angles of parallel lines are congruent). Therefore ΔSAM is similar to ΔSTU by AA (angle-angle). Redraw the triangles separately, labeling the lengths of the sides. Add the smaller segments to find the lengths of the sides of the larger triangle.
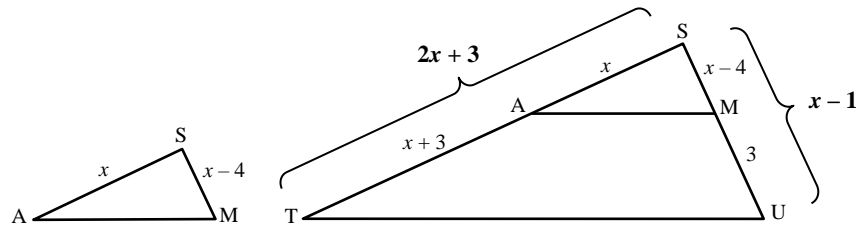
Since the triangles are similar, the corresponding sides of the triangles are proportional. Write a proportion using the given sides and solve.

$$\frac{x}{2x+3} = \frac{x-4}{x-1}$$

Multiply both sides by the common
denominator $(2x + 3)(x - 1)$: $x(x - 1) = (x - 4)(2x + 3)$
Simplify: $x^2 - x = 2x^2 + 3x - 8x - 12$
   $x^2 - x = 2x^2 - 5x - 12$
Subtract x^2 from both sides: $-x = x^2 - 5x - 12$
Add *x* to both sides: $0 = x^2 - 4x - 12$
Factor: $0 = (x - 6)(x + 2)$

In order for the product to equal zero, either one or both factors must equal zero. So set each factor equal to zero and solve:

$$x - 6 = 0 \text{ or } x + 2 = 0$$
$$x = 6 \text{ or } x = -2$$

Since *x* represents a length, *x* = -2 is not a possible solution. Therefore *x* must equal 6. Now find the length of ST. Using the redrawn triangles, note that ST has a length of 2*x* + 3. Substitute 6 for *x* and simplify: 2(6) + 3 = 12 + 3 = 15.

Note: For more information on factoring, see solution #3 on page 63.

Solutions to Page 45

Common Core Standard: 7.EE.3, F-LE.1.c
Mathematical Practice: *Model with mathematics.*

1. Plutonium-239 has a half life of 24,000 years (half life is the time it takes for half of the substance to decay). If there are 100 grams of Plutonium today, how many years must pass before there are 25 grams remaining?

    A   6,000 years

    B   36,000 years

    C   48,000 years

    D   96,000 years

Common Core Standard: 7.SP.5, 7.SP.8.a
Mathematical Practice: *Reason abstractly and quantitatively.*

2. Which of the following statements concerning probability is true?

    A   Probability values always fall between 0 and 100, inclusive.

    B   An event with a probability value of less than 1 is impossible.

    C   The set of all possible outcomes for an experiment is known as the sample space.

    D   The probability of an event occurring is the ratio of the number of ways the event can occur (successes) to the number of ways the event cannot occur (failures).

Common Core Standard: 3.MD.5, 3.MD.7.d, 6.G.3, 7.G.6
Mathematical Practice: *Look for and make use of structure.*

3. Using the figures drawn on the graph, estimate the area under the curve.

    A   24 square units

    B   32 square units

    C   48 square units

    D   72 square units
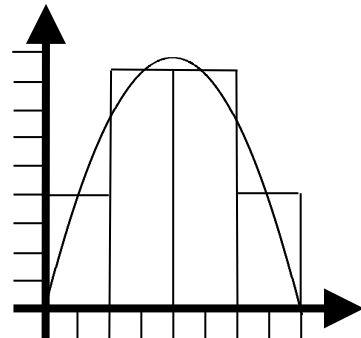
1. **(C)** If there are 100 grams of Plutonium today and it takes 24,000 years for half of that Plutonium to decay, then in 24,000 years, there will only be 50 grams of Plutonium. After another 24,000 years pass, half of the 50 grams will decay, leaving only 25 grams. So it will take 48,000 years before there are 25 grams remaining.

2. **(C)** Consider each statement:

    Choice A: Probability values always fall between 0 and 100, inclusive.

    > This statement is false since probability is defined as the ratio of the number of favorable outcomes to the total number of outcomes. Since the number of favorable outcomes cannot be greater than the total number of outcomes, the probability fraction must have a value between 0 and 1, inclusive. Note that 100% is equal to 1.

    Choice B: An event with a probability value of less than 1 is impossible.

    > This statement is false because an impossible event has a probability of 0.

    Choice C: The set of all possible outcomes for an experiment is known as the sample space.

    > This is true!

    Choice D: The probability of an event occurring is the ratio of the number of ways the event can occur (successes) to the number of ways the event cannot occur (failures).

    > This statement is false because odds compare successes to failures, whereas probability compares the number of favorable outcomes to the total number of outcomes.

3. **(C)** To estimate the area under the curve, find the area of the four rectangles shown. The area of a rectangle is the length (also referred to as the height) multiplied by the width (base). Note that the height of rectangles II and III is a fraction above the tick mark representing a whole unit. Because only an approximation is required, the height will be rounded to the nearest unit.

    Area of Rectangle I: $2 \times 4 = 8$ square units

    Area of Rectangle II: $2 \times 8 = 16$ square units

    Area of Rectangle III: $2 \times 8 = 16$ square units

    Area of Rectangle IV: $2 \times 4 = 8$ square units
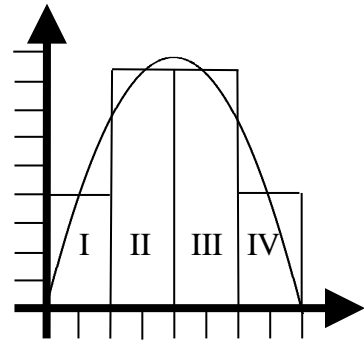
    The sum of the areas of these four rectangles is approximately 48 square units. Choice C is the appropriate answer.

Solutions to Page 72

Common Core Standard: Modeling
Mathematical Practice: *Construct viable arguments and critique the reasoning of others.*

1. Determine the converse of the given statement:

Lily does not go to the library if she goes to music lessons.

    A   If Lily goes to the library, she does not go to music lessons.

    B   If Lily goes to music lessons, she does not go to the library.

    C   If Lily does not go to the library, she goes to music lessons.

    D   If Lily does not go to music lessons, she goes to the library.

Common Core Standard: A-REI.4.b
Mathematical Practice: *Reason abstractly and quantitatively.*

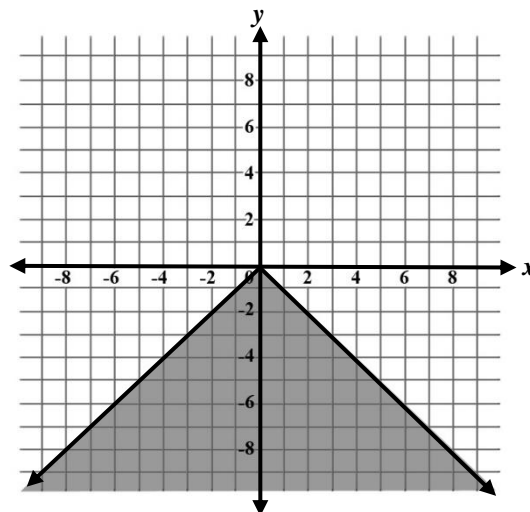2. Solve for x: $x(2x + 3) - 8 = 4 + 3x^2 - x - x^2$

    A $x = -2$

    B $x = \dfrac{12}{7}$

    C $x = 3$

    D $x = 6$

**Common Core Standard**: A-REI.12, F-IF.7.b
Mathematical Practice: *Look for and make use of structure.*

3. Which of the following inequalities represents the
    graph at right?

    A $y \le -|x|$

    B $y > -|x|$

    C $y \le -x^2$

    D $y > -x^2$

Page 85

1. **(C)** The converse of a statement reverses the hypothesis and the conclusion. The hypothesis may or may not be at the beginning of the statement. In a declarative statement, the hypothesis is the subject of the sentence. In a conditional statement, it is the clause beginning with the word "if" which, in this case, is "if she goes to music lessons." The conclusion of this sentence is "Lily does not go to the library."

<div align="center">Lily does not go to the library if she goes to music lessons.</div>

<div align="center">Conclusion   Hypothesis</div>
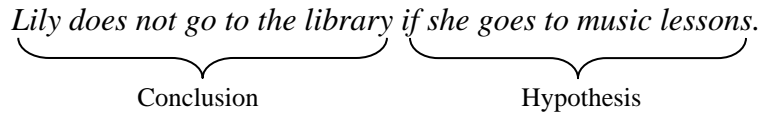
Reversing this hypothesis and conclusion produces the sentence:

<div align="center">If Lily does not go to the library, then she goes to music lessons.</div>

Note that the converse of a given statement is not logically equivalent to the original conditional statement and does not necessarily share the same truth value.

2. **(C)** Solve the equation as follows:

$$x(2x + 3) - 8 = 4 + 3x^2 - x - x^2$$

Distribute:	$2x^2 + 3x - 8 = 4 + 3x^2 - x - x^2$
Combine like terms:	$2x^2 + 3x - 8 = 4 + 2x^2 - x$
Subtract $2x^2$ from both sides:	$3x - 8 = 4 - x$
Add x to both sides:	$4x - 8 = 4$
Add 8 to both sides:	$4x = 12$
Divide both sides by 4:	$x = 3$

3. **(A)** Note that there are two different functions in the answer choices: $-|x|$ and $-x^2$. Graph each function by producing a table of values and plotting points.

x	$y = -\lvert x \rvert$	y	Ordered pair
-2	$y = -\lvert-2\rvert = -2$	-2	(-2, -2)
-1	$y = -\lvert-1\rvert = -1$	-1	(-1, -1)
0	$y = -\lvert 0 \rvert = 0$	0	(0, 0)
1	$y = -\lvert 1 \rvert = -1$	-1	(1, -1)
2	$y = -\lvert 2 \rvert = -2$	-2	(2, -2)

x	$y = -x^2$	y	Ordered pair
-2	$y = -(-2)^2 = -4$	-4	(-2, -4)
-1	$y = -(-1)^2 = -1$	-1	(-1, -1)
0	$y = -(0)^2 = 0$	0	(0, 0)
1	$y = -(1)^2 = -1$	-1	(1, -1)
2	$y = -(2)^2 = -4$	-4	(2, -4)
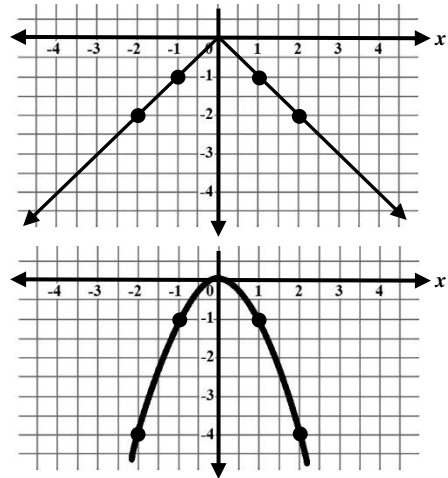
Clearly the given graph is an absolute value function, eliminating choices C and D. Now select a point such as (2, -4) in the shaded region and substitute the values for x and y into each remaining inequality (choices A and B). Because this point produces a true statement for choice A only, the correct function is $y \le -\lvert x \rvert$.

Choice A:	$y \le -\lvert x \rvert$		Choice B:	$y > -\lvert x \rvert$
Substitute:	$-4 \le -\lvert 2 \rvert$		Substitute:	$-4 > -\lvert 2 \rvert$
	$-4 \le -2$ (True)			$-4 > -2$ (False)

<div align="center">Solutions to Page 85</div>