SAT Math Medium Practice Quiz

Numbers and Operations

1. How many positive integers less than 100 are divisible by 3, 5, and 7?

(A) None
(B) One
(C) Two
(D) Three
(E) Four

2. Twice an integer is added to the square of the integer. Next, the result is increased by 1. Which of the following could be the value of the final sum?

(A) 36
(B) 41
(C) 45
(D) 48
(E) 50

3. What percent of the non-negative integers less than 30 are prime?

4. In a particular card game, the minimum score a player can achieve in a single game is 20, and the maximum score possible in a single game is 52. If a player plays three games and scores a total of 141 points, what is the least number of points that the player could have scored in one of the games?

(A) 35
(B) 36
(C) 37
(D) 38
(E) 39

5. A positive integer is subtracted from its square. The units digit of the result could be which of the following?

(A) 3
(B) 4
(C) 5
(D) 6
(E) 7

6. A three-digit number, XYZ, is formed of three non-zero digits X, Y, and Z. If the value of X is twice the value of Z, and the value of Y is three times the value of X, what is the number XYZ?

7. $\sqrt{3}$ percent of $2\sqrt{12}$ is equal to which of the following?

(A) 12

(B) $6\sqrt{12}$

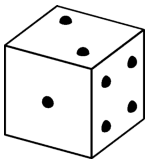
(C) $\frac{3}{25}$

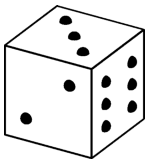
(D) $\frac{6}{25}$

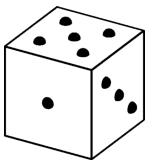
(E) $\frac{3\sqrt{12}}{25}$

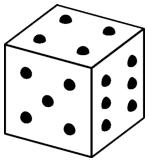
8. Amy can walk 3600 feet in 10 minutes. Walking at the same rate, how many yards can Amy walk in 10 seconds? (1 yard = 3 feet.)

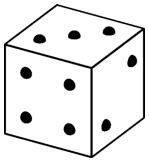
9. A standard die is a cube with one to six dots on each face. The first face has one dot, the second face has two dots, and so forth. The dots are arranged so that the total number of dots on each pair of opposite faces is 7. All of the following could be views of a standard die EXCEPT

(A) 

(B) 

(C) 

(D) 

(E) 

10. How many even integers greater than two and less then twenty are equal in value to the sum of two prime numbers?

(A) 6
(B) 7
(C) 8
(D) 9
(E) 10

11. When a particular non-zero integer is subtracted from its square, the result is neither negative nor positive. What is the integer?

12. If p is a prime number, which of the following could also be a prime number?

(A) $\frac{p}{2}$

(B) $2p$

(C) p^2

(D) $p + 2$

(E) $2p + 2$

$$m,\ 2m,\ 4m,\ \ldots$$

13. The first term in the sequence above is m, and each term thereafter is equal to twice the previous term. If m is an integer, which of the following could NOT be the sum of the first four terms of this sequence?

(A) -25
(B) -15
(C) 45
(D) 75
(E) 120

Algebra and Functions

1. Suppose that n is an integer such that $\frac{n}{3}$ is 12 greater than $\frac{n}{2}$. Which of the following is the value of n?

(A) -72
(B) -36
(C) -24
(D) 24
(E) 72

2. If k is a negative number and $\frac{(2k)^2}{8} + \frac{k}{2} = 1$, what is the value of k?

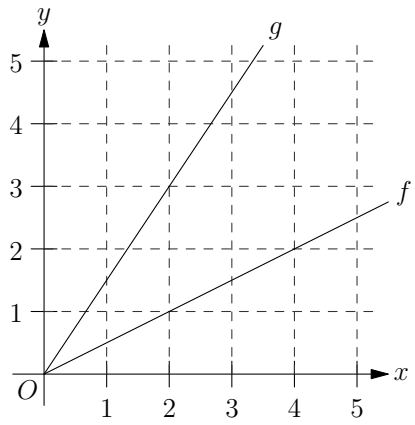
(A) -4
(B) -3
(C) -2
(D) -1
(E) 0

3. Let $f(x) = (x+3)(x-3)$ for any value of x. What is the least possible value of $f(x)$?

(A) -9
(B) -3
(C) 0
(D) 3
(E) 9

4. Let a, b, and c be non-zero numbers such that c is 24 greater than b, and b is 24 greater than a. If $\frac{c}{a} = 3$, then what is the value of b?

(A) -48
(B) -24
(C) 24
(D) 48
(E) 96



5. The graphs of the functions f and g are lines, as shown above. If $a = f(4)$, what is the value of $g(a)$?

(A) 1.5
(B) 2
(C) 3
(D) 4
(E) 4.5

6. If $\frac{x}{2} + \frac{2}{x} = x$, where $x \neq 0$, then which of the following could be the value of x?

(A) -1

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) 1

(E) 2

$$4^3 + 4^3 + 4^3 + 4^3 = 2^x$$

7. In the equation above, what is the value of x?

8. If x, y, and z are positive numbers, and x is $y\%$ of z, then which of the following must be equal in value to y?

(A) $\frac{x}{z}$

(B) $\frac{x}{100z}$

(C) $\frac{100x}{z}$

(D) $\frac{z}{x}$

(E) $\frac{100z}{x}$

9. If $\sqrt{x} = \sqrt{a}+\sqrt{b}$, then which of the following is equivalent to x?

(A) $a + b + 2\sqrt{ab}$
(B) $a + b + 2ab$
(C) $a + b + ab$
(D) $a + b$
(E) $2a + 2b$

$$x = 4m^2$$
$$y = (2m + 1)(2m - 1)$$

10. Given the two equations above, what is y in terms of x?

(A) $x - 1$

(B) $x + 1$

(C) $\frac{x^2}{2} - 1$

(D) $x^2 - 1$

(E) $x^2 + 1$

11. If $\frac{x}{0.5} + \frac{y}{0.2} = 18$, where x and y are positive integers, then what is the value of x?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

12. When $\frac{1}{3}$ is divided by the reciprocal of a particular number, the result is 8 less than the number. The number is which of the following?

(A) 3
(B) 6
(C) 8
(D) 9
(E) 12

13. If $(x + 1)^2 - (x - 1)^2 = 32$, what is the value of x?

(A) 4
(B) 6
(C) 8
(D) 10
(E) 12

14. If $xy < 82$ and y is a positive multiple of 3, what is the greatest possible integer value of x?

(A) 9
(B) 13
(C) 27
(D) 30
(E) 41

15. For two particular numbers x and y, the values of $x - y$ and $2x - y$ are consecutive odd integers, respectively. What is the value of x?

(A) -1

(B) $-\frac{1}{2}$

(C) 0

(D) 1

(E) 2

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

16. The two equations above define the functions f and g. If $f(c) = g(c)$ for some number c, what is the value of c?

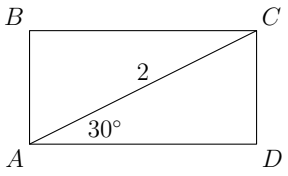
Geometry

1. The length of a particular rectangle is 4 greater than the width of the rectangle. If the perimeter of the rectangle is 16, what is the area of the rectangle?

(A) 2
(B) 6
(C) 8
(D) 12
(E) 16

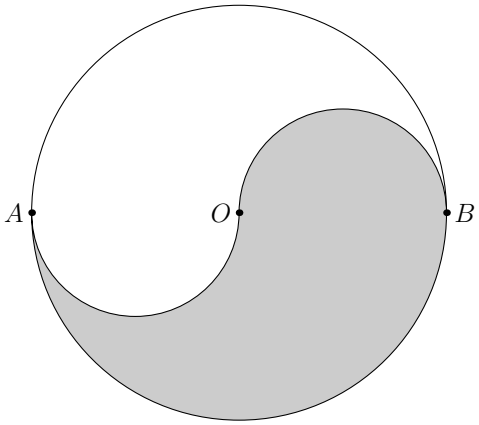
2. The area of square B is 25% greater than the area of square A. If the area of square B is 80 square inches, then what is the length in inches of the perimeter of square A?

(A) 8
(B) 12
(C) 16
(D) 32
(E) 64



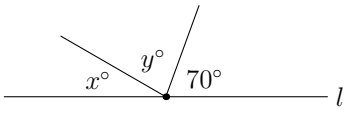
3. In the figure above, $ABCD$ is a rectangle. What is the area of $ABCD$?

(A) $\sqrt{2}$
(B) $\sqrt{3}$
(C) $\sqrt{6}$
(D) $2\sqrt{2}$
(E) $2\sqrt{3}$



4. Semicircular arcs $\widehat{AO}$ and $\widehat{OB}$ divide the circle above with center O into two regions. If the length of diameter $\overline{AB}$ is 12, what is the area of the shaded region?

(A) 6π
(B) 9π
(C) 18π
(D) 36π
(E) 72π



Note: Figure not drawn to scale.

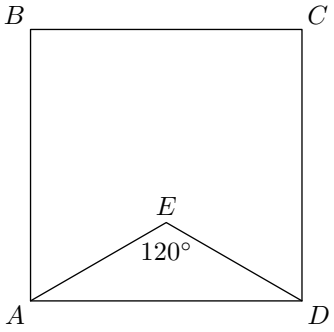
5. In the figure above, two line segments meet at a point on line l. If the value of y is equal to the square of the value of x, what is the value of y?

6. A particular square has a side of length s. If the area of the square is numerically equal to the perimeter of the square, then what is the value of s?

7. The volume of a particular cube is numerically equal to the total area of its faces. What is the length of one edge of the cube?

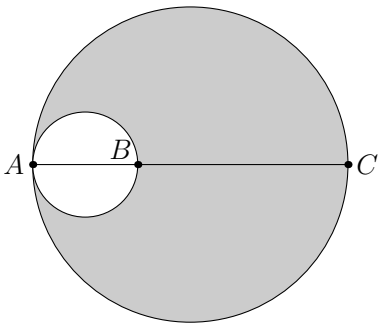
8. In the x-y plane, the line $3x + 2y = 72$ intersects the x-axis at $x = b$, for some number b. What is the value of b?

(A) 0
(B) 6
(C) 12
(D) 24
(E) 36



9. In the figure above, $ABCD$ is a square and triangle AED is isosceles. If $AE = 4$, what is the area of the square?

(A) $4\sqrt{3}$
(B) 16
(C) $16\sqrt{3}$
(D) 32
(E) 48



10. In the figure above, $\overline{AC}$ is a diameter of the large circle and B lies on $\overline{AC}$ so that $\overline{AB}$ is a diameter of the small circle. If $AB = 1$ and $BC = 2$, what is the area of the shaded region?

(A) $\frac{\pi}{4}$
(B) π
(C) 2π
(D) $\frac{9\pi}{4}$
(E) 9π

Data, Statistics, and Probability

$$\{1, 2, 3, 4, 5, 6, 7\}$$

1. Set M is shown above. Each number in set N is generated by dividing each number in set M by 2. What is the average (arithmetic mean) of the numbers in set N?

(A) 1

(B) $\frac{3}{2}$

(C) $\frac{7}{4}$

(D) 2

(E) 4

2. A family is going to choose two pets at random from among a group of four animals: a cat, a dog, a bird, and a lizard. What is the probability that the pets that the family chooses will include the lizard?

3. If x is chosen at random from the set $\{2, 3, 4, 5, 6\}$, and y is chosen at random from the set $\{11, 13, 15\}$, what is the probability that xy is even?

4. The median of a particular set of 10 integers is itself an integer. Which of the following could be true?

I. The integers of the set are all identical.

II. The integers of the set are consecutive.

III. The 5^{th} largest and 6^{th} largest integers of the set are odd.

(A) I only
(B) II only
(C) I and II only
(D) I and III only
(E) I, II, and III

SAT Math Medium Practice Quiz Answers

Numbers and Operations

1. A (Estimated Difficulty Level: 3)

You can solve this question by listing numbers divisible by 7, and checking to see which of those numbers are divisible by both 3 and 5. Some time later, you'll realize that no positive integer (that means greater than zero) which is less than 100 can be divided by all three given numbers.

If you noticed that the three numbers are all different primes, then a faster solution is to calculate the LCM (least common multiple): $3 \times 5 \times 7 = 105$. Since the LCM is greater than 100, the answer is A.

2. A (Estimated Difficulty Level: 3)

Try plugging in some real numbers until you get one of the answers. For example, if you choose 4, then calculate $2 \times 4 + 4^2 + 1 = 25$. The answers don't list 25, so choose another integer to start with. If you choose 5, you'll get $2 \times 5 + 5^2 + 1 = 36$, so the answer is A.

If you are an algebra fiend, you may notice that if the integer is x, then the calculation is $2x+x^2+1 = (x+1)^2$, so the final sum must be the square of an integer. Only answer A is a perfect square.

3. 33.3% (Estimated Difficulty Level: 3)

Since "non-negative" means 0 and greater, there are 30 non-negative integers less than 30: 0, 1, 2, ... , 29. Of those, the ones that are prime are: 2, 3, 5, 7, 11, 13, 17, 19, 23, and 29. The answer is then $10/30 \times 100 = 33.3\%$.

4. C (Estimated Difficulty Level: 3)

The least possible score in one game will occur when the player has scored the maximum possible (52 points) in each of the other two games. These two games add to 104 points, leaving $141 - 104 = 37$ points as the lowest possible score for the remaining game.

5. D (Estimated Difficulty Level: 3)

Plug in some integers to see the pattern: $1^2 - 1 = 0$, $2^2 - 2 = 2$, $3^2 - 3 = 6$, $4^2 - 4 = 12$, $5^2 - 5 = 20$, and so forth. The units digits of these results are either 0, 2, or 6, making D the correct answer.

6. 261 (Estimated Difficulty Level: 3)

Try different digits for the letters, until you get a three-digit number that works. Here, notice that X can only be one of 2, 4, 6, or 8, since it is twice a digit. Since the biggest digit is 9, and Y is three times the value of X, only 2 works for X. This choice makes Y equal to 6, and Z equal to 1, so the three-digit answer is 261.

7. C (Estimated Difficulty Level: 3)

$$\frac{\sqrt{3}}{100} \times 2\sqrt{12} = \frac{2\sqrt{3}\sqrt{12}}{100} = \frac{2\sqrt{36}}{100} = \frac{12}{100} = \frac{3}{25}$$

so that the correct answer is C.

If you aren't comfortable with radicals as above (for the SAT you really *should* be, you know), you can use your calculator and then convert the decimal answer to a fraction.

8. 20 (Estimated Difficulty Level: 3)

First, you need to remember that $d = rt$ (distance = rate × time). Next, find Amy's walking rate in yards per second. Amy can walk 3600 feet (1200 yards) in 10 minutes (600 seconds). Her walking rate is then $r = d/t = 1200/600 = 2$ yards per second. In 10 seconds, she can walk 20 yards.

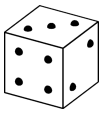
You could also set up a proportion:

$$\frac{1200}{600} = \frac{d}{10}.$$

After cross-multiplying, you will find that $d = 20$.

9. E (Estimated Difficulty Level: 3-)

Since the numbers of dots on opposite faces of the cube sum to 7, the face with four dots must be opposite the face with three dots.



The view of the die in answer E as shown above cannot be possible, since the face with three dots *and* the face with four dots are visible. These faces are not opposite each other in this view, so this is not a view of a standard die.

10. C (Estimated Difficulty Level: 3)

The even integers greater than two and less than twenty are: 4, 6, 8, 10, 12, 14, 16, and 18. For each of these integers, see if you can find two prime numbers (they could be the same or different) that add to the integer.

For example:

$$4 = 2 + 2$$
$$6 = 3 + 3$$
$$8 = 3 + 5$$

and so forth. You will find that all eight even integers can be written as the sum of two primes, so that answer C is correct.

11. 1 (Estimated Difficulty Level: 3-)

The only number that is neither positive nor negative is zero. This means that the integer in question is equal to its own square, which can only be true if the integer is 1.

12. D (Estimated Difficulty Level: 3+)

Plug in a prime number for p, and see which of the answers is also prime. (Hint: *memorize* the first few primes. You will probably want to try more than one prime number for this question.) Since there is only one correct answer, four of the answers given can *never* be prime numbers when p is prime. You'll see that answer D is the only one that can result in more prime numbers.

How to do this problem without plugging in numbers? Notice that answer A isn't even an integer (unless $p = 2$, but then $p/2 = 1$ isn't prime). Answers B and E are always even and greater than 2, so these answers can never be prime. Answer C can always be divided by p, so it is never prime. The only answer remaining is D, so it must be correct.

13. A (Estimated Difficulty Level: 3)

The first four terms are m, $2m$, $4m$, and $8m$. Plug in easy numbers for m to see what the sum is. For example, if $m = 1$, the sum is $1 + 2 + 4 + 8 = 15$. If $m = 2$, the sum is $2 + 4 + 8 + 16 = 30$. You will see that the sums are always multiples of 15, so answer A is correct since it isn't a multiple of 15.

Algebra mavens will notice that

$$m + 2m + 4m + 8m = 15m,$$

so that the sum of the first four terms is always a multiple of 15. This method is faster, but not everybody is an algebra maven.

Algebra and Functions

1. A (Estimated Difficulty Level: 3)

First, convert the words into an equation:

$$\frac{n}{3} = \frac{n}{2} + 12.$$

From here, you could work with the answers by substituting them into the equation until it works. Or, use algebra to solve the equation:

$$\frac{n}{3} - \frac{n}{2} = \frac{2n}{6} - \frac{3n}{6} = -\frac{n}{6} = 12$$

so that $n = -72$. (You could also solve the equation by multiplying through by 6 first to get rid of the fractions.)

2. C (Estimated Difficulty Level: 3)

Work with the answers, plugging them in for k until the equation works. You will see that when $k = -2$, the left-hand side of the equation becomes:

$$\frac{(-4)^2}{8} + \frac{-2}{2} = \frac{16}{8} - \frac{2}{2} = 2 - 1 = 1$$

so that answer C is correct.

Or, use algebra to solve the equation:

$$\frac{(2k)^2}{8} + \frac{k}{2} = \frac{k^2}{2} + \frac{k}{2} = 1.$$

Multiply both sides by 2 and put everything on one side:

$$k^2 + k - 2 = 0.$$

Factor this to get:

$$(k + 2)(k - 1) = 0,$$

so that $k = -2$ since we need the negative solution. Whew! Working with the answers may have been easier.

3. A (Estimated Difficulty Level: 3)

It is really helpful to recognize that $(x + 3)(x - 3) = x^2 - 9$. The equation $x^2 - y^2 = (x + y)(x - y)$ is called the difference of two squares and is useful to memorize for the SAT. Since $f(x) = x^2 - 9$ and the least possible value of x^2 is zero, then the least possible value of $f(x)$ is $0 - 9 = -9$, so answer A is correct.

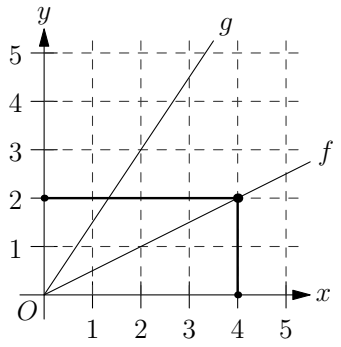
4. D (Estimated Difficulty Level: 3)

Since c is 24 greater than b, and b is 24 greater than a, c must be 48 greater than a ($c = a + 48$). Also, $c/a = 3$, which means that $c = 3a$. We substitute to get $3a = a + 48$ so that $a = 24$, which means that $b = a + 24 = 48$.

If the algebra was too tricky, you also could have used the answers by plugging them in for b, solving for a and c, and then checking to see if $c/a = 3$.

5. C (Estimated Difficulty Level: 3)

Use the graph to find $f(4)$ as follows. First, go to $x = 4$ on the x-axis. Next, go vertically up until you reach the line for the function f. Finally, go over horizontally to find the y-value for that point (see the graph below).



You should see that when $x = 4$, the y-value of function f is 2. Since $a = f(4)$, we know that $a = 2$ and we need to find $g(2)$. Repeat the process, now using the line for the function g. You will see that $g(2) = 3$.

6. E (Estimated Difficulty Level: 3)

Subtract $x/2$ from both sides of the equation to get $2/x = x/2$. Cross-multiplying, you should get $x^2 = 4$ so that $x = 2$ or $x = -2$, which makes answer E the correct one.

If you got stuck on the algebra, you also could have used the answers by plugging them in for x until the equation worked.

7. 8 (Estimated Difficulty Level: 3)

Did you notice that there are four 4^3 terms on the left side of the equation? So the left side is just $4(4^3) = 4^4 = (2^2)^4 = 2^8$, which means that $x = 8$.

If manipulating exponents isn't your thing, you could also use your calculator: figure out the left hand side (256), and then try various numbers for x until you get 256.

8. C (Estimated Difficulty Level: 3)

Convert the phrase "x is y% of z" into an equation:

$$x = \frac{y}{100} \cdot z.$$

Now, solve this equation for y by multiplying both sides by 100 and then dividing both sides by z. You should find that $y = 100x/z$, which makes answer C correct.

You could also plug in some easy numbers for y and z to determine x, and then see which of the answers is equal to the value you used for y.

9. A (Estimated Difficulty Level: 3+)

To find x, we need to square both sides of the equation:

$$(\sqrt{x})^2 = (\sqrt{a} + \sqrt{b})^2 = (\sqrt{a} + \sqrt{b})(\sqrt{a} + \sqrt{b}).$$

Now "FOIL" the right-hand side to get

$$x = (\sqrt{a})^2 + 2\sqrt{a}\sqrt{b} + (\sqrt{b})^2$$

so that

$$x = a + 2\sqrt{a}\sqrt{b} + b = a + b + 2\sqrt{ab}.$$

Did you fall for answer D? Sorry about that.

10. A (Estimated Difficulty Level: 3)

For the SAT, it is really useful to know the difference of two squares: $x^2 - y^2 = (x+y)(x-y)$. Here, the second equation is: $y = (2m+1)(2m-1) = 4m^2 - 1$. Since $x = 4m^2$, the correct answer is $y = x - 1$.

You could also plug in real numbers by making up a number for m. For example, if $m = 1$, then $x = 4$ and $y = 3$ so that $y = x - 1$.

11. D (Estimated Difficulty Level: 3+)

It is good to know some fraction-to-decimal conversions for the SAT: $1/2 = 0.5$, $1/3 = 0.\overline{33}$, $1/4 = 0.25$, and $1/5 = 0.2$. So, the equation is really:

$$\frac{x}{1/2} + \frac{y}{1/5} = 18$$

or

$$2x + 5y = 18.$$

Now, try working with the answers by plugging them in for x: you are looking for a corresponding y value that is a positive integer. (With a calculator, you can probably skip rewriting the equation and go directly to plugging in the answers for x.) Only $x = 4$ and $y = 2$ can work, so answer D is correct.

12. E (Estimated Difficulty Level: 3)

Make an equation from the words. If x is the number, then the reciprocal is $1/x$, so the equation is

$$\frac{1/3}{1/x} = x - 8.$$

This is the same as

$$\frac{x}{3} = x - 8.$$

Solving this equation gives $x = 12$.

13. C (Estimated Difficulty Level: 3)

Since $(x+1)^2 = x^2 + 2x + 1$ and $(x-1)^2 = x^2 - 2x + 1$, the equation becomes $(x^2 + 2x + 1) - (x^2 - 2x + 1) = 32$ so that $4x = 32$ or $x = 8$.

Or, work with the answers by plugging them in for x until the equation works.

14. C (Estimated Difficulty Level: 3)

Since xy is less than 82, to get the greatest possible integer value of x, we need the least possible value of y. The least positive multiple of 3 is 3, so $y = 3$. The greatest integer value of x such that $3x < 82$ is $x = 27$, so answer C is correct.

15. E (Estimated Difficulty Level: 3)

Consecutive odd integers always differ by 2. For example, 3 and 5 are consecutive, odd integers and $5 - 3 = 2$. Since $x - y$ and $2x - y$ are consecutive odd integers, we know that $(2x - y) - (x - y) = 2$. Simplifying, you will get $2x - y - x + y = 2$ so that $x = 2$, making answer E correct.

16. 3 (Estimated Difficulty Level: 3)

Since $f(c) = 2c + 1$ and $g(c) = 3c - 2$, $f(c) = g(c)$ is the same as $2c + 1 = 3c - 2$, which means that $c = 3$.

Geometry

1. D (Estimated Difficulty Level: 3)

First, let's try the algebra way: if l is the length and w is the width, then $l = w + 4$. Since the perimeter is 16, we know that $2l + 2w = 16$, so $l + w = 8$. We have two equations and two unknowns: substitute the first equation ($l = w + 4$) into the second ($l + w = 8$) to get $(w + 4) + w = 8$ so that $2w = 4$, making $w = 2$. So, $l = 6$ and the area is 12.

Another way to go: work with the answers and try to come up easy values for the length and width that multiply to give the area. For example, if the area is 8, the length and width could be 4 and 2, respectively, or 8 and 1, but neither one works since we need length to be 4 greater than the width. With an area of 12, length could be 6 and width could be 2, and this pair works.

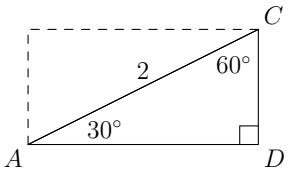
2. D (Estimated Difficulty Level: 3)

Let x be the area of square A. Remember that when you increase a number by a percent, you first multiply the number by the percent (divided by 100), then you add the original number. So, the equation we need is: $x+0.25x = 80$, so $1.25x = 80$, which means that $x = 64$.

Answer E is tempting at this point, but before you write down or bubble in your answer to an SAT math question, it can be very useful to *read the question again* to make sure that you know what the question wants. In this case, we need the square's *perimeter*, not the area. A square with an area of 64 has a side of 8, so the perimeter is 32.

3. B (Estimated Difficulty Level: 3)

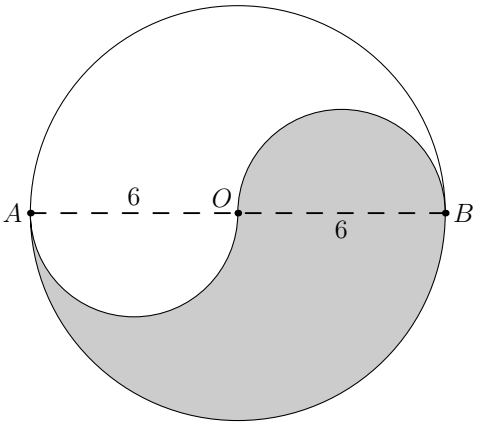
The diagonal of a rectangle divides it into two right triangles; in this case, 30-60-90 triangles. These triangles are shown on the first page of every SAT math section. (Hint: it will help to memorize or be very familiar with those formulas and diagrams on the first page.)



Using that information, $CD = 1$ and $AD = \sqrt{3}$ so that the area is $\sqrt{3}$.

4. C (Estimated Difficulty Level: 3)

Since O is the center of the circle, $AO = 6$ and $OB = 6$. Let's redraw the diagram, putting in the diameter of the big circle:



The shaded semicircle with diameter $\overline{OB}$ is equal in area to the unshaded semicircle with diameter $\overline{AO}$. So, the area of the entire shaded region is just half the area of the big circle. Since the radius of the big circle is 6, its area is 36π. The area of the shaded region is then 18π, making answer C the correct one.

5. 100 (Estimated Difficulty Level: 3)

The angles $x°$, $y°$, and $70°$ make a straight angle: they must add to $180°$. Since $y = x^2$, we know that $x + x^2 + 70 = 180$, so that $x^2 + x - 110 = 0$. Factoring the left side of the equation gives: $(x - 10)(x + 11) = 0$, so that either $x = 10$ or $x = -11$. We only want positive angles, so $x = 10$ and the answer is $y = 100$. Did you answer too quickly by saying 10? Oops! Before you answer a math question, always reread it to be sure you are answering what it is asking for.

If factoring is not your thing, you could try plugging in real numbers for x until the angles add up to $180°$. Remember that no question on the SAT *requires* you to have a calculator, so x won't be something like 8.4 if you have to square it like you do here.

6. 4 (Estimated Difficulty Level: 3)

The area of the square is s^2, and the perimeter is $4s$. Since we are told that these two quantities are equal, $s^2 = 4s$, so that $s = 4$.

7. 6 (Estimated Difficulty Level: 3)

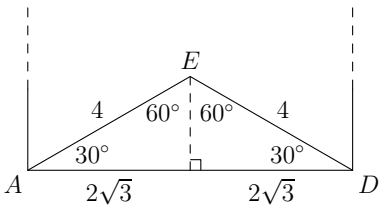
Suppose that the length of one edge of the cube is equal to x. Then, the volume of the cube is x^3. There are six faces on the cube, and each face is a square with side of length x. So, the total area of the faces is $6x^2$. Since the volume equals the area, $x^3 = 6x^2$, making $x = 6$.

8. D (Estimated Difficulty Level: 3)

The phrase "intersects the x-axis at $x = b$" is code (sometimes called "math-speak") for "goes through the point $(b, 0)$". If a line goes through a point, the point satisfies the equation of the line. Plugging $x = b$ and $y = 0$ into the equation gives $3b = 72$, or $b = 24$.

9. E (Estimated Difficulty Level: 3+)

First, note that $AE = 4$ and $ED = 4$. (Hint: fill in the diagram with information that you are given or can figure out.) When a $120°$ angle is used in a triangle, it is often a clue that a 30-60-90 triangle (shown on the first page of each SAT math section) is involved in the question. If you draw a line from E perpendicular to the bottom side of the square, you should see that two of these special triangles are formed, as shown in the figure below.



Using the 30-60-90 triangle figure given to you (even better, know it from memory), the side opposite the $30°$ angle is 2, and the side opposite the $60°$ angle is $2\sqrt{3}$. Then, the side of the square is $2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3}$ so that the area of the square is $(4\sqrt{3})^2 = 48$.

10. C (Estimated Difficulty Level: 3)

To find the area of the shaded region, we need to find the area of the large circle and subtract the area of the small circle. The diameter of the large circle is 3, so its area is $\pi(3/2)^2 = 9\pi/4$. The diameter of the small circle is 1, so its area is $\pi(1/2)^2 = \pi/4$. The area of the shaded region is then $9\pi/4 - \pi/4 = 8\pi/4 = 2\pi$.

Data, Statistics, and Probability

1. D (Estimated Difficulty Level: 3)

One way to do this is to find all the numbers in set N, and then calculate the average of those numbers. (Your calculator may be useful here.) Set N is:

$$\{0.5,\ 1,\ 1.5,\ 2,\ 2.5,\ 3,\ 3.5\}$$

so that the average of the numbers in set N is $14/7 = 2$.

It may be easier and less error-prone to notice that if you divide a set of numbers by 2, the average of the set will get divided by 2 as well. Since the average of set M is 4, the average of set N is 2.

2. 1/2 or 0.5 (Estimated Difficulty Level: 3)

Often, a good way to start probability problems on the SAT is to list all the possibilities, and then count the number that match the given criteria. Using "c" for cat, "d" for dog, and so forth, all the possible combinations of two pets are:

cd
cb
cl
db
dl
bl

Since three of the six possible combinations include the lizard, the probability that the two pets chosen by the family include the lizard is $3/6 = 1/2 = 0.5$.

3. 3/5 or 0.6 (Estimated Difficulty Level: 3)

There are 15 possible values of xy:

$$2 \times 11 = 22$$
$$2 \times 13 = 26$$
$$2 \times 15 = 30$$
$$3 \times 11 = 33$$
$$\ldots$$

and so forth. You should find that 9 of these are even, so that the probability that xy is even is $9/15 = 3/5 = 0.6$.

You may also notice that an even product will result only when you multiply by one of 2, 4, or 6, so that there will be $3 \times 3 = 9$ even numbers out of $3 \times 5 = 15$ numbers total.

4. D (Estimated Difficulty Level: 3+)

For choice I, suppose that the set is a group of ten 2's. The median of this set is 2, which is an integer, so choice I could be true.

For choice II, note that for a set of ten numbers, there is no single "middle" number, so the median is the average of the two middle numbers (the 5^{th} largest and 6^{th} largest). But the average of any two consecutive integers is never an integer, so choice II can never be true. (As an example, suppose that the set is the integers from 1 to 10. The two middle numbers are 5 and 6 and the median is $(5 + 6)/2 = 5.5$.)

This reasoning helps with choice III: suppose that the middle two numbers (the 5^{th} largest and 6^{th} largest) are 7 and 11. Then the median is $(7 + 11)/2 = 9$, which is an integer, so choice III could be true, making answer D correct.