

## SAT Math Function Quiz

1. If  $f(x) = 2x - 5$ , then what is the value of  $f(2) + f(5)$ ?

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

2. If  $h(x) = 3x + 5$  and  $h(a) = 27$ , then what is the value of  $a$ ?

3. Let  $f(x) = 4x - 3$ . If  $f(a) = 9$  and  $f(b) = 5$ , then what is  $f(a + b)$ ?

(A) 5  
(B) 7  
(C) 14  
(D) 16  
(E) 17

4. If  $f(x) = x^2 - 1$ , and  $f(2a) = 35$ , then what could be the value of  $a$ ?

(A) -6  
(B) -3  
(C) 1  
(D) 2  
(E) 6

5. If  $f(x) = 2x + 4$ , then what is the value of  $f(4) + f(6)$ ?

(A)  $f(8)$   
(B)  $f(10)$   
(C)  $f(12)$   
(D)  $f(18)$   
(E)  $f(28)$

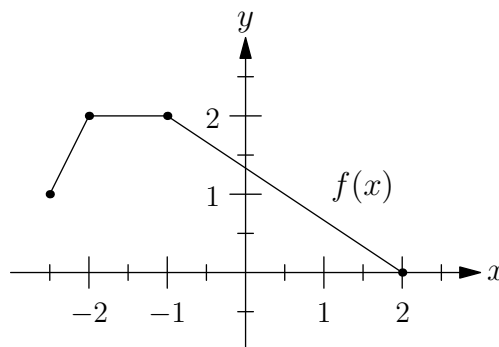
$$z(q) = 4q + \frac{1}{2}$$

6. The zoomster function  $z$  used in space flight engineering is defined above. If, for some number  $u$ ,  $z(u + 1/2) = 1/2$ , then what is the value of  $u$ ?

(A)  $-3/2$   
(B)  $-1/2$   
(C)  $-1/8$   
(D)  $1/8$   
(E)  $1/2$

7. For any positive integer  $n$ , let  $n^\heartsuit$  be defined by  $n^\heartsuit = 2n(n+1)$ . What is the value of  $\frac{8^\heartsuit}{2^\heartsuit}$ ?

(A)  $2^\heartsuit$   
(B)  $4^\heartsuit$   
(C)  $6^\heartsuit$   
(D)  $8^\heartsuit$   
(E)  $10^\heartsuit$



8. For the function  $f$  graphed in the  $xy$ -plane above, if  $f(-2.5) = k$ , then what is  $f(2k)$ ?

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## Answers

1. D

First, find  $f(2)$  by plugging in 2 for  $x$  in the expression  $2x - 5$ . We get  $f(2) = 2 \cdot 2 - 5 = 4 - 5 = -1$ . Similarly,  $f(5) = 2 \cdot 5 - 5 = 5$ . Then,  $f(2) + f(5) = -1 + 5 = 4$ , so answer D is correct.

2.  $22/3$  or 7.33

First, find  $h(a)$ . Whatever is inside the parentheses of a function gets substituted for  $x$  in the given expression for the function. So here,  $h(a) = 3a + 5$ . Since  $h(a) = 27$ , we have  $3a + 5 = 27$ , so that  $3a = 22$  and  $a = 22/3$  (or  $a = 7.33$ ).

This question is typical on the SAT and ACT; it is asking us to go “backwards”. Suppose that  $y = h(x)$ . Instead of giving us  $x$  and asking us for  $y$ , it is giving us  $y$  and asking us for  $x$ . Also, don’t be fooled by the use of the different letters ( $h$  instead of  $f$  for the function, and  $a$  instead of  $x$ ); the math is the same.

3. E

Since  $f(a) = 4a - 3$  and  $f(a) = 9$ , then  $4a - 3 = 9$  so that  $4a = 12$  and  $a = 3$ . Similarly,  $f(b) = 4b - 3 = 5$  so that  $4b = 8$  and  $b = 2$ . Finally,  $f(a + b) = f(3 + 2) = f(5) = 4 \cdot 5 - 3 = 17$ . Answer E is correct.

4. B

We substitute the  $2a$  inside the function parentheses for  $x$  in the expression  $x^2 - 1$ . This gives  $f(2a) = (2a)^2 - 1 = 4a^2 - 1$ . Since  $f(2a) = 35$ , we have  $4a^2 - 1 = 35$ , so that  $4a^2 = 36$ , or  $a^2 = 9$ . Solving for  $a$  gives  $a = \pm 3$ , and answer B is correct. Note that since there can be only one answer, 3 is not given as an answer choice.

In this case, don’t forget to substitute *everything* inside the parentheses into  $x$ . A common mistake here is to square the  $a$  but not the 2, resulting in the expression  $2a^2 - 1 = 35$ , which is incorrect.

5. C

Since  $f(4) = 2(4) + 4 = 12$ , and  $f(6) = 2(6) + 4 = 16$ , then  $f(4) + f(6) = 12 + 16 = 28$ . To figure out which answer is correct, we have to evaluate each one until we get 28 as the value. Since  $f(12) = 2(12) + 4 = 28$ , answer C is correct.

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6. B

To evaluate  $z(u + 1/2)$ , we need to substitute *everything* inside the parentheses into  $q$ , i.e., we substitute  $u + 1/2$  for  $q$  in the definition of the function  $z$ . We get:  $z(u + 1/2) = 4(u + 1/2) + 1/2 = 4u + 2 + 1/2 = 4u + 5/2$ . Since  $z(u + 1/2) = 1/2$ , this means that  $4u + 5/2 = 1/2$ . Solving for  $u$ , we get  $4u = -2$ , or  $u = -1/2$ .

7. A

This question is an example of what I call “wacky functions”. These are functions in the disguise of weird symbols that you probably have never seen in math class before. That is because the symbols are completely made up! The question will always tell you exactly what the symbol means. In this case, we are told that  $n^{\heartsuit} = 2n(n + 1)$ . This means, for example, that  $8^{\heartsuit} = 2 \cdot 8 \cdot (8 + 1) = 2 \cdot 8 \cdot 9 = 144$ . Similarly,  $2^{\heartsuit} = 2 \cdot 2 \cdot (2 + 1) = 2 \cdot 2 \cdot 3 = 12$ . Therefore,  $8^{\heartsuit}/2^{\heartsuit} = 144/12 = 12$ . Since  $2^{\heartsuit} = 12$ , choice A is correct.

Note that this question is *identical* to the following “regular” function question:

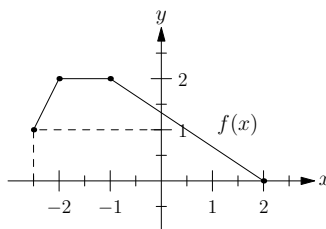
For any positive integer  $n$ , let  $f(n)$  be defined by  $f(n) = 2n(n+1)$ .

What is the value of  $\frac{f(8)}{f(2)}$ ?

- (A)  $f(2)$
- (B)  $f(4)$
- (C)  $f(6)$
- (D)  $f(8)$
- (E)  $f(10)$

8. 0

Use the graph to determine  $f(-2.5)$ . Go along the  $x$ -axis to  $-2.5$ , then draw a straight line up to the curve, then another straight line over to the  $y$ -axis:



The  $y$ -value at that point is 1, and since  $f(-2.5) = k$ ,  $k = 1$ . The question is asking: what is  $f(2k)$ ? Since  $2k = 2$ , we find  $f(2)$  by using the graph in the same way as before. Since, at  $x = 2$ , the curve hits the  $x$ -axis ( $y = 0$ ), the answer is 0.