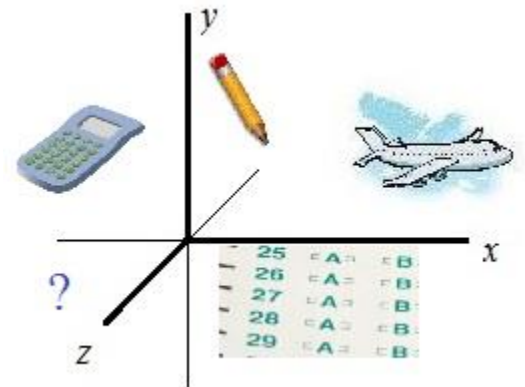


# SAT Math Level 2

## Practice Test A

25 multiple choice math questions (and solutions)



[Mathplane.com](http://Mathplane.com)

Topics include arc length, distance, probability, circles, functions, summation, sequences, trigonometry, domain, range, and more.

Ultra-Marathon

100K Challenge



"Red e..  
Set..  
GO!"



Testing the limits of endurance,  
these math figures will run on and on...

LanceAF #87 5-24-13  
www.mathplane.com

Practice test ->

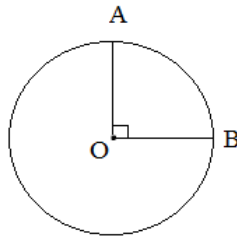
SAT Subject Test - Math Level 2 Practice

1) If  $f(x) = \frac{3x + 7}{6x + 4}$  what value does  $f(x)$  approach as  $x$  gets infinitely larger?

- a) 0
- b)  $1/2$
- c)  $3/4$
- d)  $7/4$
- e) infinity

2) O is the center of the circle, and the diameter is 12. What is the arc length  $\widehat{AB}$  ?

- a)  $3\pi$
- b)  $6\pi$
- c)  $9\pi$
- d)  $18\pi$
- e)  $36\pi$



3) What is the distance in space between  $(1, 0, 5)$  and  $(-3, 6, 3)$ ?

- a) 4
- b) 6
- c)  $2\sqrt{11}$
- d)  $2\sqrt{14}$
- e) 12

4)  $|5 - 7| - |7 - 5| =$

- a) -4
- b) 0
- c) 2
- d) 4
- e) 12

5) A line has the parametric equation  $x = t + 5$  and  $y = t + 10$ . What is the slope of the line?

- a) 1
- b) 2
- c) 5
- d) 10
- e) 50

SAT Subject Test - Math Level 2 Practice

- 6) Two dice are tossed. What is the probability that neither die is a 4?
- a)  $1/6$
  - b)  $1/3$
  - c)  $2/3$
  - d)  $25/36$
  - e)  $5/6$
- 7)  $(1, 6)$ ,  $(3, -2)$ , and  $(-2, K)$  are collinear points. What is  $K$ ?
- a)  $-6$
  - b)  $2$
  - c)  $8$
  - d)  $10$
  - e)  $18$
- 8) Vectors  $u$  and  $v$  are given by  $u = (3, 0)$  and  $v = (1, -4)$ . What is the length of vector  $w$ , given by  $w = 2u - v$ ?
- a)  $2\sqrt{10}$
  - b)  $\sqrt{41}$
  - c)  $6 - \sqrt{17}$
  - d)  $3$
  - e)  $\sqrt{23}$
- 9) The domain of  $g(x) = \frac{3}{\sqrt{4-x^2}}$  is:
- a)  $[-2, 2]$
  - b)  $(-2, 2)$
  - c)  $(0, 2)$
  - d)  $(-\infty, -2)$
  - e)  $(-\infty, 2)$
- 10) The radius of circle  $x^2 - 4x + y^2 + 6y = 3$
- a)  $3$
  - b)  $\sqrt{3}$
  - c)  $4$
  - d)  $8$
  - e)  $16$

SAT Subject Test - Math Level 2 Practice

- 11)  $f(x) = 2x + 1$      $g(x) = x^2 - 1$      $(f \circ g)(x) =$
- $x^2 + 2x$
  - $2x^3 + x^2 - 2x - 1$
  - $2x^2 - 1$
  - $4x^2 + 4x$
  - $2(x^2 + x + 1)$
- 12) The intersection of line  $x + y = 2$  and circle  $x^2 + y^2 = 4$  occurs when  $x =$
- 2, 2
  - 2, 0, 2
  - 2, 4
  - 0, 2
  - 0, 4
- 13) Which is a zero of the function  $f(x) = \sin 2(x) - 1/2$  ?
- $\frac{-\pi}{12}$
  - $\frac{-\pi}{3}$
  - $\frac{-\pi}{2}$
  - 0
  - $-\pi$
- 14) A circle is inscribed in a square. If the area of the square is 36 sq. units, what is the area of the circle?
- $6\pi$
  - $9\pi$
  - $12\pi$
  - $18\pi$
  - $36\pi$
- 15) Find the sum
- 100
  - 2250
  - 4500
  - 4550
  - 4850
- $$\sum_{n=1}^{100} (n-2)$$

SAT Subject Test - Math Level 2 Practice

- 16) In the  $xy$ -plane, the vertices of a triangle are  $(-1, 3)$ ,  $(6, 3)$  and  $(-1, -4)$ .  
The area of the triangle is:

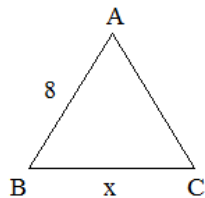
- a) 10
- b) 17.5
- c) 24.5
- d) 35
- e) 42

- 17) A right cylinder has radius 5 and height 5. If A and B are points on the surface, what is the maximum possible (line) distance between them?

- a) 5
- b)  $5\sqrt{2}$
- c) 10
- d) 12.5
- e)  $5\sqrt{5}$

- 18) In the figure,  $AB = BC$  and  $\angle A = 80$ . What is  $x$ ?

- a) 8
- b) 10.3
- c) 11.4
- d) 12
- e) 12.7



- 19)  $f(x) = 2x^2$  is translated 2 units to the right and 1 unit up.

If the resulting graph is  $g(x)$ , then what is  $g(3)$ ?

- a) 3
- b) 11
- c) 15
- d) 26
- e) 31

- 20) A sequence is (recursively) defined as  $a_1 = 0$ ,  $a_2 = 1$  and, for  $n > 2$ ,  $a_n = a_{n-1} - 3a_{n-2}$ .

- a) -8
- b) 1
- c) 18
- d) 72
- e) 109

What is  $a_6$ ?

SAT Subject Test - Math Level 2 Practice

21) If  $\sin \Theta = .47$ , then  $\sin(\pi - \Theta) =$

- a)  $-.47$
- b)  $-.43$
- c)  $0$
- d)  $.43$
- e)  $.47$

22) What is the range of the function defined as  $g(x) = \frac{1}{x} + 3$

- a) all real numbers
- b) all real numbers except 0
- c) all real numbers  $> 3$
- d) all real numbers except 3
- e) all real numbers  $> 1$

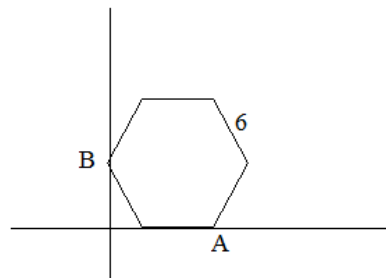
23)

For the matrices  $A = \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix}$   $B = \begin{bmatrix} 2 & 2 \\ -1 & 4 \end{bmatrix}$  What is  $BA$  ?

- a)  $\begin{bmatrix} 3 & 5 \\ -1 & 3 \end{bmatrix}$
- b)  $\begin{bmatrix} 1 & -1 \\ -1 & 5 \end{bmatrix}$
- c)  $\begin{bmatrix} -1 & 14 \\ 1 & -4 \end{bmatrix}$
- d)  $\begin{bmatrix} 2 & 4 \\ -1 & -7 \end{bmatrix}$
- e) none of the above

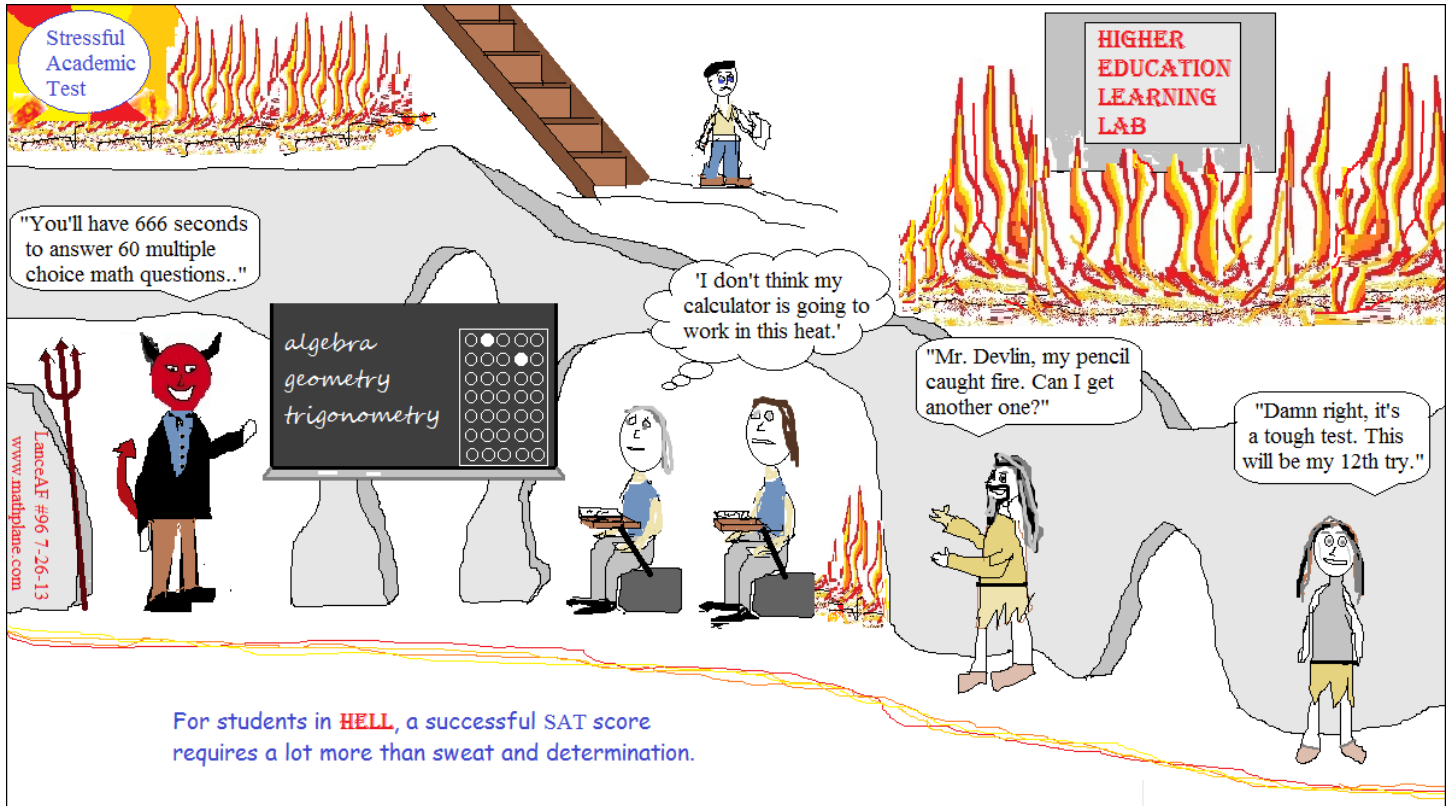
24) In the figure, there is a regular hexagon with sides of length 6. If the coordinate of A is (9, 0), what is the y-coordinate of B?

- a) 0
- b) 3
- c)  $3\sqrt{2}$
- d)  $3\sqrt{3}$
- e)  $4\frac{1}{2}$



25) A sample of 25 scores has a mean 75, median 79, and standard deviation of 8. If you increase every score by 10, which of the following is true?

- a) I only
  - b) II only
  - c) I and II only
  - d) none
  - e) I, II, and III
- I. The new mean is 85
  - II. The new median is 89
  - III. The new standard deviation is 18



Solutions ->



1) If  $f(x) = \frac{3x + 7}{6x + 4}$  what value does  $f(x)$  approach as  $x$  gets infinitely larger?

- a) 0
- b) 1/2**
- c) 3/4
- d) 7/4
- e) infinity

Since the rational expression is neither "top heavy" nor "bottom heavy", look at the lead coefficients....

$$\frac{3}{6} = 1/2$$

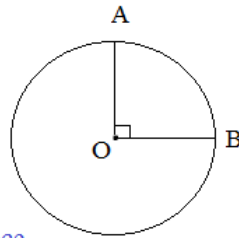
2) O is the center of the circle, and the diameter is 12. What is the arc length  $\widehat{AB}$  ?

- a)  $3\pi$**
- b)  $6\pi$
- c)  $9\pi$
- d)  $18\pi$
- e)  $36\pi$

Circumference =  $\pi$ (diameter)  
or  $2\pi$ (radius)

So, circumference of circle O is  $12\pi$

Since  $\angle AOB$  is 90 degrees, the arc length of AB is 1/4 of the circumference



$$\frac{90^\circ}{360^\circ} \cdot \pi(12) = 3\pi$$

3) What is the distance in space between (1, 0, 5) and (-3, 6, 3)?

- a) 4
- b) 6
- c)  $2\sqrt{11}$
- d)  $2\sqrt{14}$**
- e) 12

$$\begin{aligned} \text{distance} &= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2} \\ &= \sqrt{(1 - (-3))^2 + (0 - 6)^2 + (5 - 3)^2} = \sqrt{16 + 36 + 4} = \sqrt{56} \\ &= 2\sqrt{14} \end{aligned}$$

4)  $|5 - 7| - |7 - 5| =$

- a) -4
- b) 0**
- c) 2
- d) 4
- e) 12

$$|-2| - |2| = 2 - 2 = 0$$

5) A line has the parametric equation  $x = t + 5$  and  $y = t + 10$ . What is the slope of the line?

- a) 1**
- b) 2
- c) 5
- d) 10
- e) 50

$$x = t + 5$$

so,

$$t = x - 5$$

then, using substitution,

$$y = (x - 5) + 10 \longrightarrow y = x + 5 \text{ (slope is 1)}$$

6) Two dice are tossed. What is the probability that neither die is a 4?

- a)  $1/6$   
 b)  $1/3$   
 c)  $2/3$   
 d)  $25/36$   
 e)  $5/6$
- $p(\text{1st is NOT } 4) = 5/6$   
 $p(\text{2nd is NOT } 4) = 5/6$   
 since each die is independent,  
 $p(\text{neither is } 4) = (5/6)(5/6) = 25/36$

7)  $(1, 6)$ ,  $(3, -2)$ , and  $(-2, K)$  are collinear points. What is  $K$ ?

- a)  $-6$   
 b)  $2$   
 c)  $8$   
 d)  $10$   
 e)  $18$
- If 3 points are collinear, they are on the same line ---- i.e. each pair with have the same slope!  
 slope of  $(1, 6)$  and  $(3, -2)$  is  $\frac{-2 - 6}{3 - 1} = -4$   
 slope of  $(1, 6)$  and  $(-2, K)$  must be  $-4$   $\frac{K - 6}{-2 - 1} = -4$   $K = 18$

8) Vectors  $u$  and  $v$  are given by  $u = (3, 0)$  and  $v = (1, -4)$ . What is the length of vector  $w$ , given by  $w = 2u - v$ ?

- a)  $2\sqrt{10}$   
 b)  $\sqrt{41}$   
 c)  $6 - \sqrt{17}$   
 d)  $3$   
 e)  $\sqrt{23}$
- $w = 2(3, 0) - (1, -4)$   
 $w = (5, 4)$   
 $\|w\| = \sqrt{(5)^2 + (4)^2} = \sqrt{41}$

9) The domain of  $g(x) = \frac{3}{\sqrt{4 - x^2}}$  is:

- a)  $[-2, 2]$   
 b)  $(-2, 2)$   
 c)  $(0, 2)$   
 d)  $(-\infty, -2)$   
 e)  $(-\infty, 2)$
- cannot have negative under a radical  
 and cannot have zero in the denominator...  
 so, must be between  $-2$  and  $2$

10) The radius of circle  $x^2 - 4x + y^2 + 6y = 3$

- a)  $3$   
 b)  $\sqrt{3}$   
 c)  $4$   
 d)  $8$   
 e)  $16$
- complete the square to change into standard form...  
 $x^2 - 4x + 4 + y^2 + 6y + 9 = 3 + 4 + 9$   
 $(x - 2)^2 + (y + 3)^2 = 16$  radius = 4  
 $(x - h)^2 + (y - k)^2 = r^2$

SAT Subject Test - Math Level 2 Practice

SOLUTIONS

11)  $f(x) = 2x + 1$      $g(x) = x^2 - 1$

$(f \circ g)(x) =$

a)  $x^2 + 2x$

b)  $2x^3 + x^2 - 2x - 1$

c)  $2x^2 - 1$

d)  $4x^2 + 4x$

e)  $2(x^2 + x + 1)$

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

$2x^2 - 2 + 1$

$2x^2 - 1$

12) The intersection of line  $x + y = 2$  and circle  $x^2 + y^2 = 4$  occurs when  $x =$

a)  $-2, 2$

b)  $-2, 0, 2$

c)  $-2, 4$

d)  $0, 2$

e)  $0, 4$

solve algebraically:

$y = -x + 2$

$x^2 + y^2 = 4$

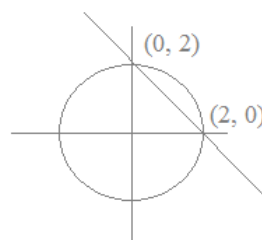
(substitution)

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

$x^2 + x^2 - 4x + 4 = 4$

$2x^2 - 4x = 0$

$2x(x - 2) = 0$      $x = 0, 2$



13) Which is a zero of the function  $f(x) = \sin 2(x) - 1/2$  ?

a)  $-\frac{\pi}{12}$

b)  $-\frac{\pi}{3}$

c)  $-\frac{\pi}{2}$

d)  $0$

e)  $-\pi$

$\sin 2x - 1/2 = 0$

$\sin 2x = 1/2$

$2x = \frac{\pi}{6}$

$x = \frac{\pi}{12}$

14) A circle is inscribed in a square. If the area of the square is 36 sq. units, what is the area of the circle?

a)  $6\pi$

b)  $9\pi$

c)  $12\pi$

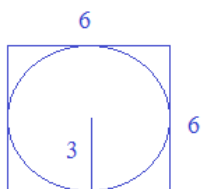
d)  $18\pi$

e)  $36\pi$

Area of circle =  $\pi r^2$

area =  $\pi 3^2$

=  $9\pi$



since area of square is 36, each side is 6...

If a side is 6, then the radius must be 3...

15) Find the sum

a)  $-100$

b)  $2250$

c)  $4500$

d)  $4550$

e)  $4850$

$\sum_{n=1}^{100} (n - 2)$

$\sum_{n=1}^{100} n - \sum_{n=1}^{100} 2$

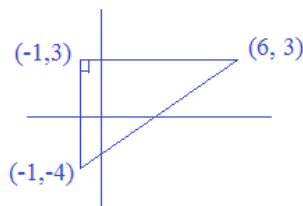
$(100 + 1)(50) - 2(100)$   
=  $4850$

sum formula:  $\frac{n(a_1 + a_n)}{2}$   
number of terms first term last term

- 16) In the  $xy$ -plane, the vertices of a triangle are  $(-1, 3)$ ,  $(6, 3)$  and  $(-1, -4)$ .  
The area of the triangle is:

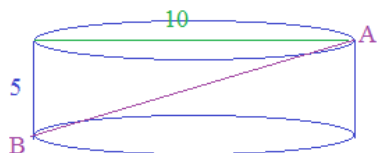
- a) 10  
b) 17.5  
c) 24.5  
d) 35  
e) 42

$$\begin{aligned} \text{Area} &= 1/2 (\text{base})(\text{height}) \\ \text{Area} &= 1/2(7)(7) \\ &= 49/2 = 24.5 \end{aligned}$$



- 17) A right cylinder has radius 5 and height 5. If A and B are points on the surface, what is the maximum possible (line) distance between them?

- a) 5  
b)  $5\sqrt{2}$   
c) 10  
d) 12.5  
e)  $5\sqrt{5}$



radius is 5, so the diameter is 10!!

The maximum line distance is the hypotenuse of the "right triangle of the cylinder"

$$5^2 + 10^2 = AB^2 \quad AB = \sqrt{125} = 5\sqrt{5}$$

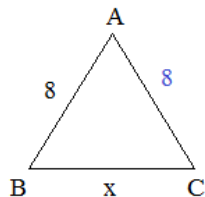
- 18) In the figure,  $AB = BC$  and  $\angle A = 80$ . What is  $x$ ?

- a) 8  
b) 10.3  
c) 11.4  
d) 12  
e) 12.7

use of law of sines:  $\frac{\sin A}{x} = \frac{\sin C}{8}$

$$x = \frac{8 \sin A}{\sin C}$$

$$x = \frac{8(\sin 80)}{\sin 50} = \frac{8(.985)}{(.766)} = 10.3$$



$AB = BC$ , so

$$\angle B = \angle C$$

angles  $A + B + C = 180$ ,  
so  $B$  and  $C$  are 50 degrees...

- 19)  $f(x) = 2x^2$  is translated 2 units to the right and 1 unit up.

If the resulting graph is  $g(x)$ , then what is  $g(3)$ ?

- a) 3  
b) 11  
c) 15  
d) 26  
e) 31

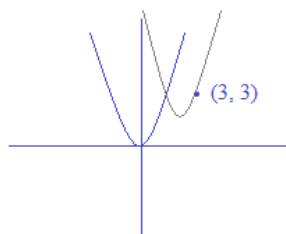
$$f(x) = 2x$$

shift 2 units to the right:  $2(x-2)^2$

shift 1 unit up:  $2(x-2)^2 + 1$

$$g(x) = 2(x-2)^2 + 1$$

$$g(3) = 2(3-2)^2 + 1 = 3$$



- 20) A sequence is (recursively) defined as  $a_1 = 0$ ,  $a_2 = 1$  and, for  $n > 2$ ,  $a_n = a_{n-1} - 3a_{n-2}$

- a) -8  
b) 1  
c) 18  
d) 72  
e) 109

input	output
1	0
2	1
3	1 $\rightarrow$ $1 - 3(0)$
4	-2 $\rightarrow$ $1 - 3(1)$
5	-5 $\rightarrow$ $-2 - 3(1)$
6	1 $\rightarrow$ $-5 - 3(-2)$

What is  $a_6$ ?

21) If  $\sin \Theta = .47$ , then  $\sin(\pi - \Theta) =$

- a)  $-.47$
- b)  $-.43$
- c)  $0$
- d)  $.43$
- e)  $.47$**

Using the difference of angles trig identity:

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\sin \pi \cos \Theta - \cos \pi \sin \Theta$$

$$0 (\cos \Theta) - (-1) \sin \Theta = \sin \Theta$$

22) What is the range of the function defined as  $g(x) = \frac{1}{x} + 3$

- a) all real numbers
- b) all real numbers except 0
- c) all real numbers  $> 3$
- d) all real numbers except 3**
- e) all real numbers  $> 1$

(the domain is all real numbers except 0)

The range represents all possible outputs...

Since  $1/x$  will never equal zero, 3 will never be an output!

23)

For the matrices  $A = \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix}$   $B = \begin{bmatrix} 2 & 2 \\ -1 & 4 \end{bmatrix}$

NOTE:  $BA \neq AB$

What is  $BA$  ?

$$BA = \begin{bmatrix} 2 & 2 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 2(1) + 2(0) & 2(3) + 2(-1) \\ -1(1) + 4(0) & -1(3) + 4(-1) \end{bmatrix}$$

a)  $\begin{bmatrix} 3 & 5 \\ -1 & 3 \end{bmatrix}$

b)  $\begin{bmatrix} 1 & -1 \\ -1 & 5 \end{bmatrix}$

c)  $\begin{bmatrix} -1 & 14 \\ 1 & -4 \end{bmatrix}$

**d)  $\begin{bmatrix} 2 & 4 \\ -1 & -7 \end{bmatrix}$**

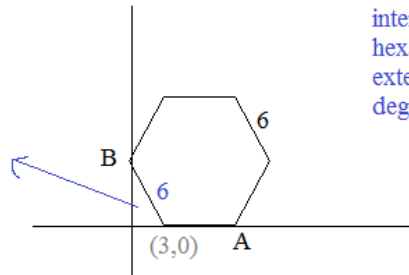
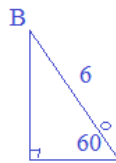
e) none of the above

24) In the figure, there is a regular hexagon with sides of length 6. If the coordinate of A is (9, 0), what is the y-coordinate of B?

- a) 0
- b) 3
- c)  $3\sqrt{2}$
- d)  $3\sqrt{3}$**
- e)  $4\frac{1}{2}$

if hypotenuse of 30-60-90 right triangle is 6, then small side is 3 and middle leg is  $3\sqrt{3}$

B is  $(0, 3\sqrt{3})$



interior angles of regular hexagon are 120 degrees. exterior angles are 60 degrees

25) A sample of 25 scores has a mean 75, median 79, and standard deviation of 8. If you increase every score by 10, which of the following is true?

- a) I only
- b) II only
- c) I and II only**
- d) none
- e) I, II, and III

- I. The new mean is 85
- II. The new median is 89
- III. The new standard deviation is 18

note: the difference of each score relative to the mean hasn't changed, because all the scores increased together! therefore the standard deviation is unchanged..

*How did you do?*

*Want more test prep questions?*

- 1) A game has 2 spinners. Spinner #1 has a probability of landing red of  $\frac{2}{3}$ . And, spinner #2 has a probability of landing red of  $\frac{1}{5}$ .  
What is the probability spinner #1 lands red AND spinner #2 does NOT land red?

- a)  $\frac{2}{15}$
- b)  $\frac{8}{15}$
- c)  $\frac{13}{15}$
- d)  $\frac{1}{5}$
- e)  $\frac{3}{5}$

- 2) For some positive real number 'b',  
 $b - 1$ ,  $b + 4$ ,  $3b + 2$ . What is the

- a) 16
- b) 20
- c) 24
- d) 28
- e) 40

- 3) Which equation best models the following data in the table:

- a)  $y = 1.2(4.4)^x$

x	-6.7	-1.3	3.2	8.8
	1.20	2.47	7.80	21.80

150 SAT Subject Test  
Math Level 2  
Practice Questions  
(and, Solutions)

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The proceeds go to site maintenance and treats for Oscar the Dog.

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