

## Reason Prep's SAT Math Diagnostic Test

This diagnostic is different from a lot of other SAT diagnostic tests because the questions do **not** simulate SAT problems. Use this test not to see how well you can do on an SAT math section - you can try a real practice section to find that out - but to determine your **current knowledge** of the various topics tested on the SAT. While it is not comprehensive, this test will give you a good idea about **what you know, what you kinda know, and what you don't know.**

The answer key is provided at the end of the test; if you'd like video explanations of each question, check out the associated video answer key. The answer key will also list the relevant videos that can help you with each topic. Though you should prioritize your weaknesses, don't ignore your areas of strength! Simply use this diagnostic as a starting point to address major deficiencies first.

**Directions:** Take the test untimed. ***FOR BEST RESULTS, AVOID USING A CALCULATOR WHEN POSSIBLE.*** When finished, check your answers. Circle the problems you got wrong and highlight the topics you had trouble with. View the relevant videos; then start practicing with real SATs.

### Numbers, Definitions, and Operations

1. What is an integer?

2. An even number plus an odd number always equals an \_\_\_\_\_ number.

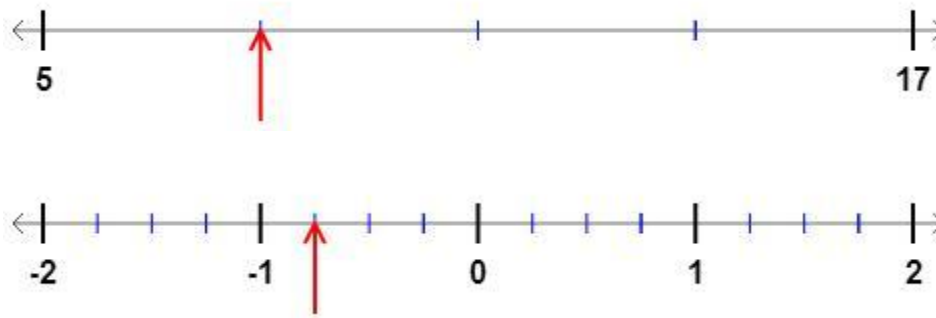
An even number times an odd number always equals an \_\_\_\_\_ number.

3. Name the first four consecutive positive even integers.

Name the four largest consecutive negative odd integers.

4. These five consecutive integers add up to 0.

5. What are the values of the red arrows?



6.

$$\sqrt{\sqrt{16}} =$$

$$\sqrt{x^2} =$$

7. Simplify this fraction:

$$\frac{54}{72} =$$

8. Perform the following operations:

$$\frac{4}{5} + \frac{2}{3} =$$

$$\frac{4}{5} - \frac{2}{3} =$$

$$\frac{4}{5} \times \frac{2}{3} =$$

$$\frac{4}{5} \div \frac{2}{3} =$$

9. What is the reciprocal of...

$$-\frac{17}{13}$$

10. Put these decimals in order from least to greatest:

.32,  $-.4$ , .033, .0099,  $-.09$ ,  $-.0001$

11. Name the first four prime numbers.

12. What is the prime factorization of 180?

13. What are three multiples of 20?

14. What is the remainder when 26 is divided by 7?

15. Mario gets 3 extra lives for every 42 coins he obtains. How many coins must he gather if he wants 7 extra lives?

16. Robert drives 30 miles per hour (mph) for 2 hours, 50 mph for half an hour, and 5 mph for 7 hours. How many miles did he drive during the trip?

17. Convert into fractions, decimals, and percents:

Fraction	Decimal	Percent
$\frac{6}{25}$		
	.25	
		22%

18. What is 30% of 200?

19. 16 is what percent of 80?

20. 32 is 20% of a number. What is that number?

21. What is the 8th term of this sequence?

0, 3, 6, 9, ...

22. John starts a project on Monday. He finishes it 125 days later. What day of the week does he finish?

23. Set A =  $\{1, 43, 5, -2, 5, 18\}$

Set B =  $\{-1, 2, 18, 7, 0, 42\}$

Which term(s) are common to both sets?

24. Cool Kid High School offers ice hockey and baseball. Out of 54 total students who play sports, 18 play ice hockey and 6 play both ice hockey and baseball. How many students play baseball?

25. Barney is making a sandwich. He has three choices of bread, four choices of meat, two choices of cheese, and 6 condiments. If he can choose only one bread, meat, cheese, and condiment, how many different kinds of sandwiches could he make?

26. Mary is the judge of a dancing contest. She has no idea what she's doing, so she decides to award the prizes randomly. How many different ways can she award first, second, and third place if there are five contestants?

27. The ratio of wins to losses for the New York Rangers was 5 to 2. If the Rangers played 63 games, how many losses did they have?

28. Given the statement, "All of Kaitlyn's friends are singers," **must** the following be true: "If Henrik is a singer, he is Kaitlyn's friend"?

29. A bookstore sells a certain book for \$20. After its rival closes down, the bookstore raises this book's price to \$30. What was the percent change?

Algebra and Functions

30. Solve for x.

$$\frac{x}{4} + -6 = 5$$

31. Three times the product of four and a number is equal to eleven less than that number. What is twice the number?

32. Solve for all x:

$$x^2 - 5x = 6$$

33. Simplify this expression:

$$\frac{6}{2x + 4} \div \frac{(x - 3)^2}{x^2 - x - 6}$$

34. What is the greatest x that satisfies this equation?

$$3x^3 - 12x = 0$$

35. Factor completely.

$$9a^2 - 64b^6$$

36. Combine.

$$\frac{(x^3 \cdot x^2)^4}{x^7}$$

37. Solve for x.

$$10 + 6x^{-1} = 12$$

38. Solve for x.

$$27^{3x+1} = 9^6$$

39. Solve for x.

$$\sqrt{x+2} - 10 = 0$$

40. What is the smallest value of x that satisfies this equation?

$$|3x - 3| = 15$$

41. What are all the values of  $x$  that satisfy:

$$5x - 6 \geq 24$$

42. Find the values of  $x$  and  $y$  that satisfy the following system of equations:

$$\begin{aligned} x + y &= 3 \\ 3x - 2y &= 14 \end{aligned}$$

43. Solve for all  $x$  that satisfy:

$$\frac{5x - 20}{x^3 + 2x^2 - 5x + 5} = 0$$

44.  $A$  is inversely proportional to  $B$ . If  $A = 10$  when  $B = 3$ , then what does  $A$  equal when  $B = 5$ ?

45.  $f(x) = x^2 - 7x + 1$

a)  $f(0) =$

b)  $f(4) =$

c)  $f(a + b) =$

(you don't have to expand the answer)

46. If

$$f(x) = 9 - 7x$$

and



$$f(x) = -5$$

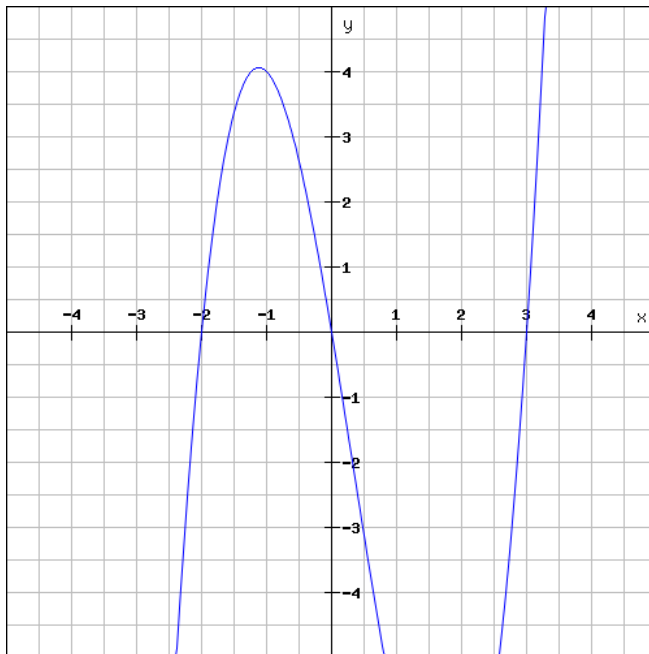
what does x equal?

47.

x	f(x)	g(x)
0	0	-3
1	1	2
2	5	1
3	8	-4
4	10	-8

Using the above table,  $f(g(1)) =$

48. Given the graph of f(x):



a)  $f(-0.5) =$

b)  $f(x) = 0$  where  $x =$

49. If

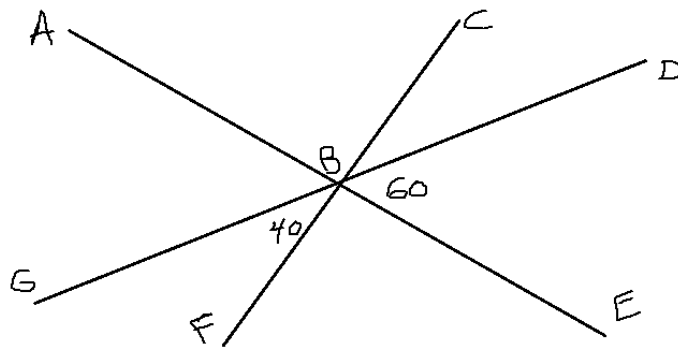
$$a \triangleright b = a^2 + b^2 - ab$$

then  $2 \triangleright 3 =$

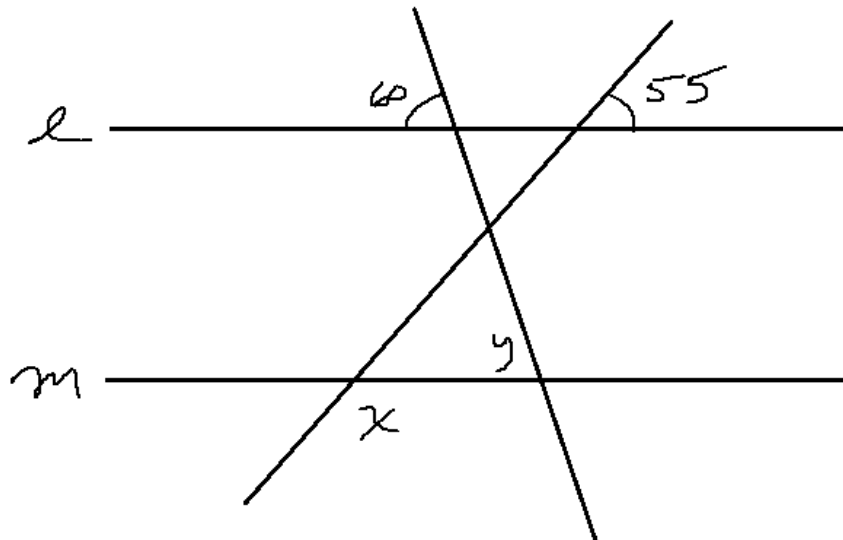
50. Changing  $f(x)$  to  $f(x - 2) - 3$  shifts the original function \_\_\_\_ units to the LEFT or RIGHT and \_\_\_\_ units UP or DOWN.

Geometry

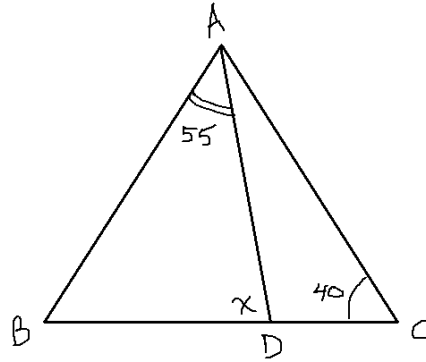
51. What is the measure of  $\angle ABC$ ?



52. Line  $l$  is parallel to line  $m$ . Find the degree measures of  $x$  and  $y$ .

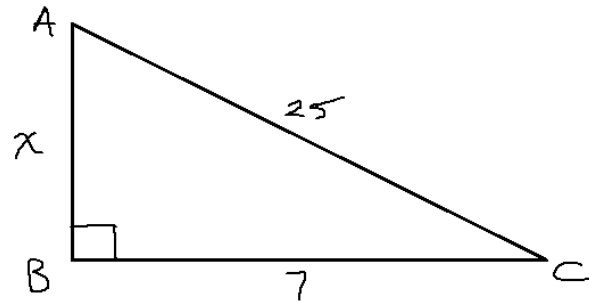


53.  $\overline{AB}$  is equal to  $\overline{AC}$ . Find the degree measure of  $x$ .



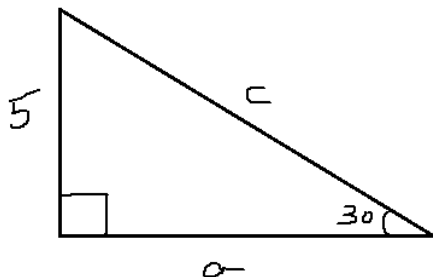
54. Right triangle  $ABC$  has sides 6, 8, and 10. What is the area of the triangle?

55. Find  $x$ .

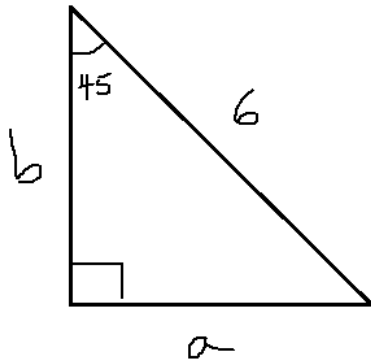


56. Find the length of the missing sides *exactly* (no decimals allowed).

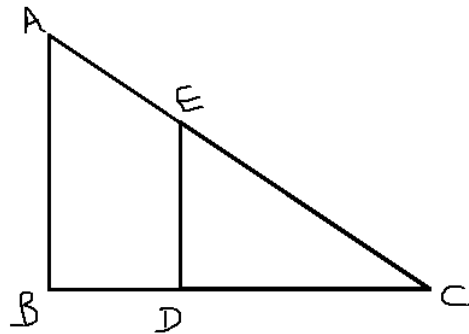
a)



b)

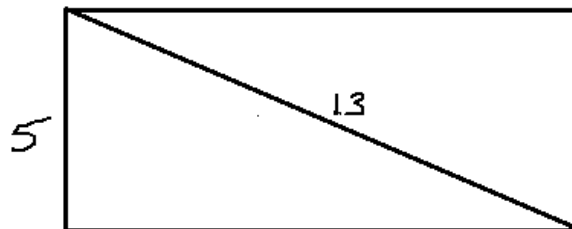


57.  $\triangle ABC$  is similar to  $\triangle EDC$ . If  $\overline{CD} = 10$ ,  $\overline{BD} = 5$ , and  $\overline{DE} = 6$ , what does  $\overline{AB}$  equal?



58. A triangle has sides of 6 and 10. What are the possible lengths of the third side?

59. What is the area of this rectangle?

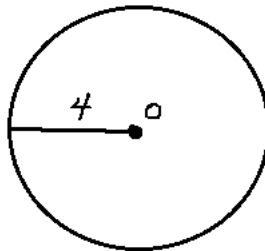


60. What is the measure of each angle in a regular hexagon?

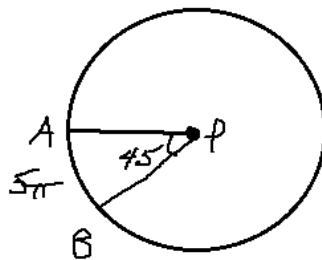
61. A cube has an edge of 5. What is the surface area of the cube? What is its volume?

62. An isosceles triangle has one side with length 6 and another side with length 10. What are the possible perimeters for this triangle?

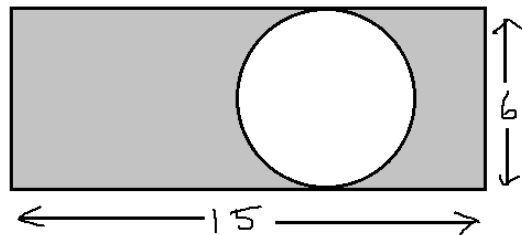
63. What is the circumference of circle O? What is its area? (You can leave your answer in terms of  $\pi$ .)



64. Arc AB has length  $5\pi$ . What is the area of circle P?

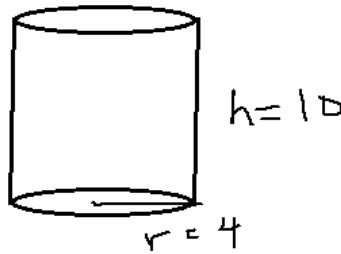


65. What is the area of the shaded region? Leave your answer in terms of  $\pi$ .



66. A rectangular prism has length 5, width 6, and height 2. What is its volume?

67. What is the volume of this cylinder? Leave your answer in terms of  $\pi$ .



68. Line  $l$  passes through  $(6, 2)$  and the origin. What is its slope?

69. What is the slope of a line parallel to  $2x + 3y = -2$ ? What is the slope of a line perpendicular to  $2x + 3y = -2$ ?

Charts, Graphs, and Statistics

70. Given the list: 5, 10, -2, 10, 6, -2, 1

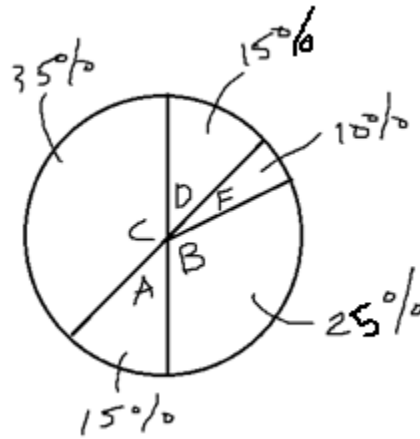
a) what is the average (arithmetic mean)?

b) what is the median?

c) what is the mode?

71. Gilligan has cards numbered 1 through 10. If he selects one of these ten cards at random, what is the probability that he selects a card with a prime number?

72. The pie chart below shows the breakdown in class grades.



If 70 students got Cs, how many students got Fs?

**Answer Key**

1. Any positive or negative whole number (or 0) - not decimal or fraction. (*Properties of Integers, Arithmetic*)
2. odd...even (*Properties of Integers, Arithmetic*)
3. 2, 4, 6, 8  
-7, -5, -3, -1 (*Properties of Integers, Arithmetic*)
4. -2, -1, 0, 1, 2 (*Properties of Integers, Arithmetic*)
5. 8, -.75 (*Number Lines*)
6. 2, x (*Squares & Square Roots*)
7.  $\frac{3}{4}$  (*Fractions*)
8.  $\frac{22}{15}$ ,  $\frac{2}{15}$ ,  $\frac{8}{15}$ ,  $\frac{6}{5}$  (*Fractions*)
9.  $-\frac{13}{17}$  (*Fractions, Reciprocals*)
10.  $-.4 < -.09 < -.0001 < .0099 < .033 < .32$   
(*Decimals*)
11. 2, 3, 5, 7 (*Prime Numbers, Arithmetic*)
12.  $2 \times 2 \times 3 \times 3 \times 5$  (*Factors*)
13. 20, 40, 60, ... (*Multiples*)
14. 5 (*Remainders*)
15. 98 (*Proportions*)
16. 120 miles (*Rates*)
17. .24, 24%  
 $\frac{1}{4}$ , 25%  
 $\frac{11}{50}$ , .22 (*Percents, Decimals, Fractions*)
18. 60 (*Percents*)
19. 20% (*Percents*)
20. 160 (*Percents*)
21. 21 (*Sequences*)
22. Sunday (*Sequences*)
23. 18 (*Sets*)
24. 42 (*Sets, Venn Diagrams*)
25. 144 (*Counting Problems*)
26. 60 (*Counting Problems*)
27. 18 (*Ratios*)
28. NO (*Logic*)
29. 50% increase (*Percent Change*)
30. 44 (*Algebra Basics*)
31. -2 (*Translating Words into Equations*)
32. 6, -1 (*Quadratics, Parabolas*)
33.  $\frac{3}{(x-3)}$  (*Factoring*)
34. 2 (*Factoring*)
35.  $(3a+8b^3)(3a-8b^3)$  (*Factoring*)
36.  $x^{13}$  (*Exponents*)
37. 3 (*Exponents*)
38. 1 (*Exponents*)
39. 98 (*Radicals*)
40. -4 (*Absolute Value*)
41.  $x \geq 6$  (*Inequalities*)
42.  $x = 4$ ,  $y = -1$  (*Systems of Equations*)
43. 4 (*Rational Equations*)
44. 6 (*Direct & Inverse Variation*)
45. a) 1  
b) -11  
c)  $(a + b)^2 - 7(a + b) + 1$  (*Functions*)
46. 2 (*Functions*)
47. 5 (*Functions*)
48. a) 2.5  
b) -2, 0, 3 (*Functions*)
49. 7 (*Symbolic Functions*)
50. 2 right, 3 down (*Transformations*)
51.  $80^\circ$  (*Angles*)
52.  $x = 125^\circ$ ,  $y = 60^\circ$  (*Angles, Parallel Lines*)
53. 85 (*Triangles*)
54. 24 (*Triangles*)
55. 24 (*Triangles*)
56.  $a = 5\sqrt{3}$ ,  $c = 10$   
 $a = b = 3\sqrt{2}$  (*Special Triangles*)
57. 9 (*Similar Triangles*)
58.  $4 < c < 16$  (*Triangle Inequality*)
59. 60 (*Area*)
60. 120 (*Polygons*)



- 61.  $SA = 150$ ,  $V = 125$  (*Solid Geometry*)
- 62. 26, 22 (*Perimeter*)
- 63.  $C = 8\pi$ ,  $A = 16\pi$  (*Circles*)
- 64.  $A = 400\pi$  (*Circles*)
- 65.  $90 - 9\pi$  (*Circles, Shaded Area*)
- 66. 60 (*Solid Geometry*)
- 67.  $160\pi$  (*Solid Geometry*)
- 68.  $1/3$  (*Slopes*)
- 69.  $-2/3$ ;  $3/2$  (*Slopes; Parallel & Perpendicular*)
- 70. a) 4  
b) 5  
c) 10 and -2 (*Mean, Median, Mode*)
- 71.  $2/5$  [*Probability*]
- 72. 20 (*Percents; Circle Graphs*)