PRACTICE TEST 10

Dr. John Chung's SAT Math

3  3

Math Test - No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

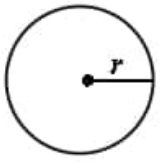
DIRECTIONS

For questions 1–15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 16–20**, solve the problem and enter your answer in the grid on your answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTE

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

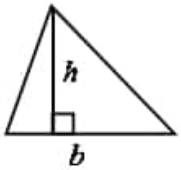
REFERENCE



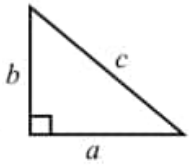
$A = \pi r^2$

$C = 2\pi r$

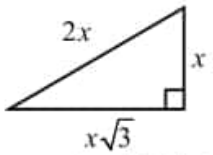
$A = \ell w$

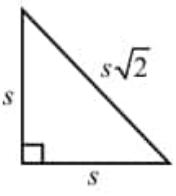


$A = \frac{1}{2}bh$

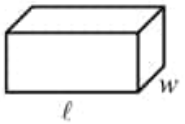


$c^2 = a^2 + b^2$

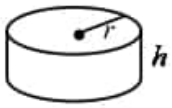




Special Right Triangles

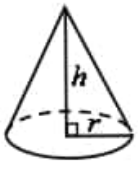


$V = \ell wh$

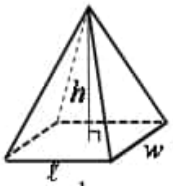


$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π.

The number of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

If $\frac{5}{2x-3}=\frac{5}{x}$, what is the value of $2x-3$?

A) 0

B) 1

C) 3

D) 5

2

$$2x+y\le 3$$
$$x-y<-3$$

Which of the following ordered pairs (x,y) satisfies the system of inequalities above?

A) $(-1, 0)$

B) $(-1, -1)$

C) $(-2, 4)$

D) $(-3, 0)$

3

A salesman's commission is k percent of the selling price of a car. This week Peter, a salesman, sold 10 cars for \$20,000 each. Which of the following represents the commission this week?

A) $200k$

B) $2,000k$

C) $\frac{20,000}{k}$

D) $\frac{20,000k}{100+k}$

4

Emily is walking a trail. After walking k percent of the length of the trail, she has 10 km left to go. Which of the following represents the length of the trail?

A) $10(100-k)$

B) $\frac{100-k}{10}$

C) $\frac{10k}{100-k}$

D) $\frac{1000}{100-k}$

CONTINUE

5

$$C(x) = 140{,}000 + 85x$$

A company that produces smart phones pays a start-up cost and a certain amount of money to produce each smart phone. The cost of producing x smart phones is given by the function above. What is the meaning of the value 85 in the function?

A) the start-up cost

B) the selling price of one smart phone

C) the amount spent to produce each smart phone

D) the profit earned from the sale of one smart phone

6

Which of the following equations has the same solution as $2x^2 + 12x - 32 = 0$?

A) $2(x+3)^2 = 32$

B) $2(x-3)^2 = 25$

C) $(x+3)^2 = 25$

D) $(x+3)^2 = 32$

7

The marketing department of a company estimates the price P, in dollars, of a smart phone by the equation $P = 500 - 25x$ over 10 years, where x is the number of years. What is the estimated decrease, in dollars, each year?

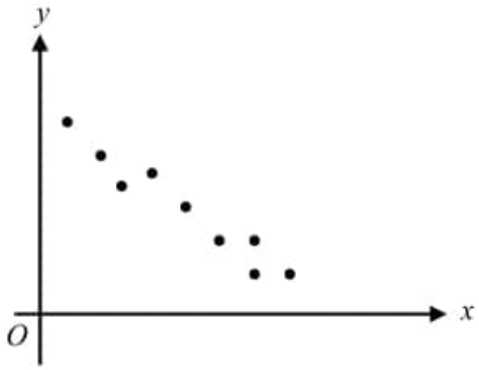
A) 20

B) 25

C) 100

D) 500

8



Which of the following best represents the correlation coefficient of the linear fit of the data shown above?

A) 0.95

B) −0.95

C) −1.00

D) −1.05

CONTINUE

9

$$2x - 3y = 6$$
$$y = x - 4$$

What is the solution (x, y) to the system of equations above?

A) $(3, -1)$

B) $(4, 0)$

C) $(5, 1)$

D) $(6, 2)$

10

Which of the following equations has a graph in the xy-plane for which y is always greater than 0?

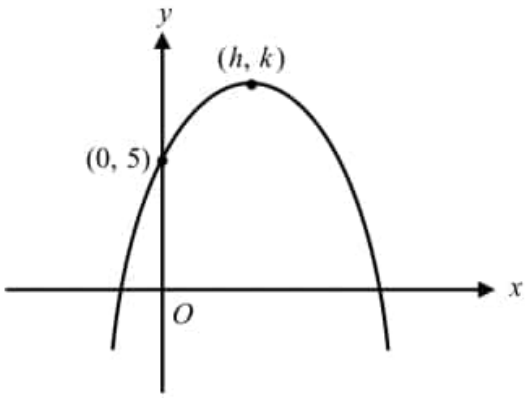
A) $y = x + 2$

B) $y = (x - 2)^2$

C) $y = x^3 + 2$

D) $y = |x| + 2$

11



Note: Figure not drawn to scale.

The graph of $y = a(x + 1)(x - 5)$ is shown in the xy-plane above, where a is a constant. If the graph with vertex (h, k) intersects the y-axis at point $(0, 5)$, which of the following is equal to k?

A) 7

B) 8

C) 9

D) 10

12

If $k = \frac{(x + 1)(x - 1)}{3}$ and $k \neq 0$, what does $3x^2$ equal in terms of k?

A) $3k$

B) $9k$

C) $3k + 1$

D) $9k + 3$

CONTINUE

13

The average (arithmetic mean) of three positive numbers, a, b, and c is 15. When the greatest of these numbers is subtracted from the sum of the other two, the result is 5. If $a < b < c$, what is the value of $a + b$?

A) 20

B) 25

C) 30

D) 40

14

$$\frac{a(x+1)+b(x-1)}{x-2}=2+\frac{1}{x-2}$$

The equation above is true for all values of $x \neq 2$, where a and b are constants. What is the value of a?

A) $-\frac{1}{2}$

B) 2

C) 3

D) 4

15

What are the solutions to $3(x-3)^2-6=14$?

A) $x=3\pm\sqrt{20}$

B) $x=\frac{3\pm\sqrt{20}}{3}$

C) $x=3\pm\frac{\sqrt{20}}{3}$

D) $x=3\pm\frac{\sqrt{60}}{3}$

CONTINUE

16

$$|x-5| \le \frac{1}{2}$$

What is the least value of x that satisfies the inequality above?

17

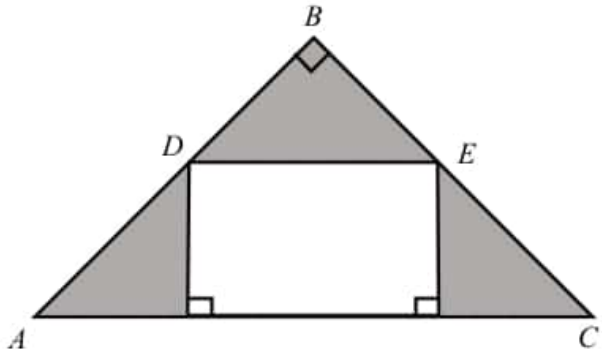
If the diameter of a cylindrical jar is increased by 100% without altering the volume, by what percent must the height be decreased? (Note: Disregard the % sign when gridding your answer.)

18

$$f(x) = \frac{x^2}{2} - 20x + k$$

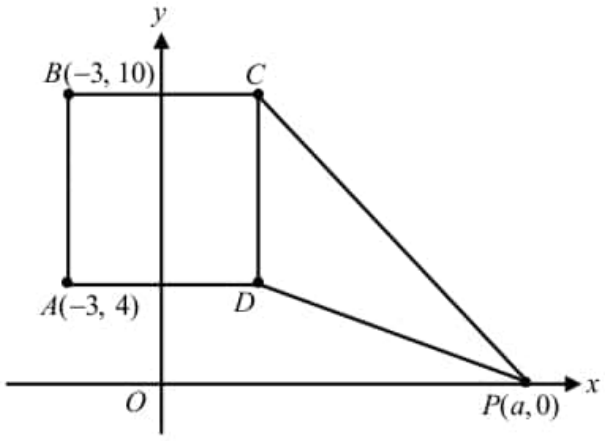
In the function f above, k is a constant. In the xy-plane, for what value of x does $f(x)$ have the same value of $f(10)$?

19



In the isosceles right triangle above, $AB = BC = 10\sqrt{2}$. Points D and E are the midpoints of $\overline{AB}$ and $\overline{BC}$ respectively. What is the area of the shaded region?

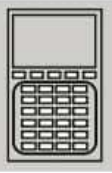
20



In the xy-plane above, the area of square $ABCD$ is equal to the area of triangle CDP. What is the value of a?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

4  4

Math Test - Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 31-38**, solve the problem and enter your answer in the grid on your answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

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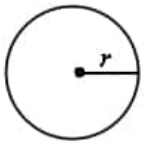

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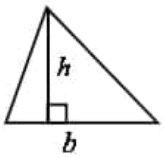
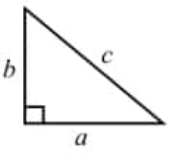
$C = 2\pi r$

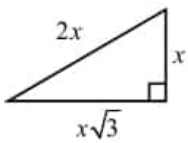
$A = \ell w$

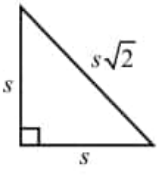


$A = \frac{1}{2}bh$

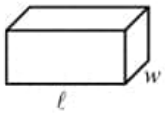


$c^2 = a^2 + b^2$

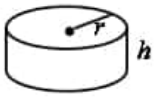




Special Right Triangles

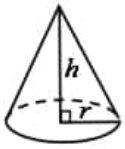


$V = \ell wh$

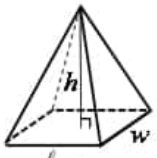


$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π.

The number of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

An advertising medium charges d dollars for a basic fixed fee plus c cents for every 10 letters for an advertising campaign. If 300 letters are used for an advertising campaign, which of the following expressions represents the total amount, in dollars, of the advertisement?

A) $\frac{3c}{10}+d$

B) $3c+d$

C) $30c+d$

D) $300c+d$

2

$$f(x)=ax+b$$

In the function above, a and b are constants. If $f(0)=3$ and $f(3)=-8$, what is the value of $f(6)$?

A) -22

B) -19

C) -16

D) -12

3

$$y=2^x$$
$$y=x+5$$

If ordered pair (x, y) is the solution to the system of equations above, what is the value of y?

A) 2

B) 8

C) 16

D) 32

4

If $f(x-5)=x^2-5$, which of the following is equal to $f(-2)$?

A) 4

B) 1

C) -1

D) -4

CONTINUE

5

If $a+b=10$ and $\frac{1}{a}+\frac{1}{b}=20$, what is the value of ab?

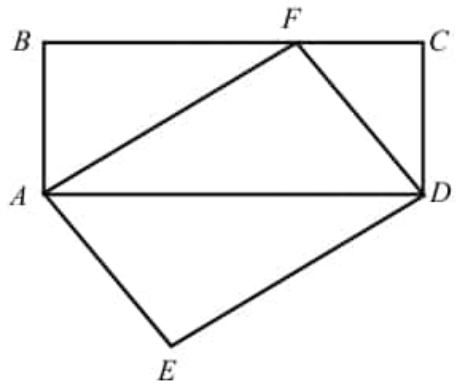
A) $\frac{1}{4}$

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

C) 2

D) 4

6



In the figure above, the area of rectangle $ABCD$ is 25. What is the area of parallelogram $AFDE$?

A) 12.5

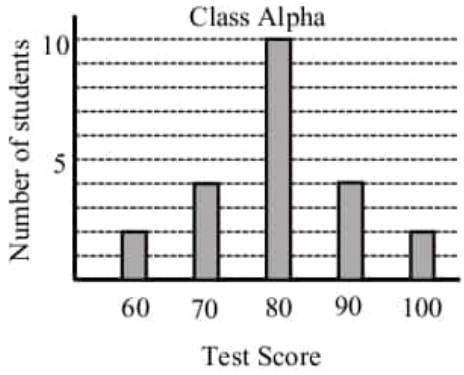
B) 18

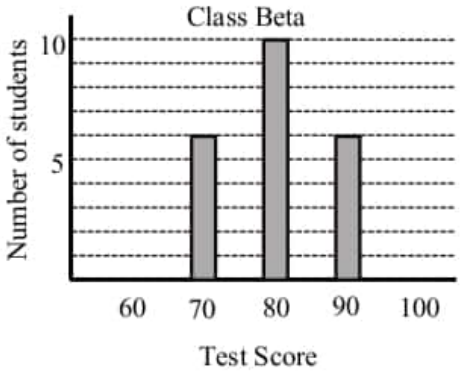
C) 25

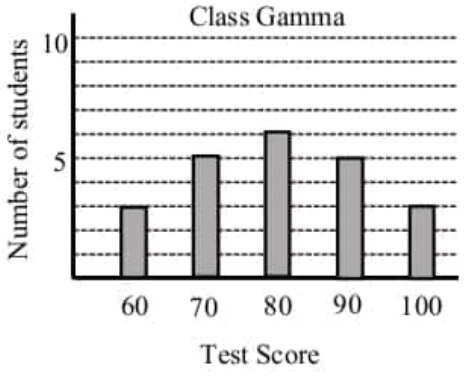
D) 27.5

CONTINUE

Questions 7 and 8 refer to the following information.







The scores on a final reading test of three junior classes in a certain high school were shown on the bar graphs above.

7

Which class has the least standard deviation?

A) Class Alpha

B) Class Beta

C) Class Gamma

D) Based on the data, it cannot be determined.

8

What is the overall average score of these three combined classes?

A) 78

B) 80

C) 82

D) 84

CONTINUE

9

$$f(x) = x^2 - 8x + 12.$$

The function f is shown above. In the xy-plane, what are the coordinates of the vertex of the parabola defined by $g(x) = f(x-3)$?

A) $(-4, 7)$

B) $(4, 12)$

C) $(7, -4)$

D) $(7, 12)$

10

If a total of \$9,000 is invested at an annual interest rate of 2% compounded monthly, which of the following expressions shows the amount of interest after 10 years?

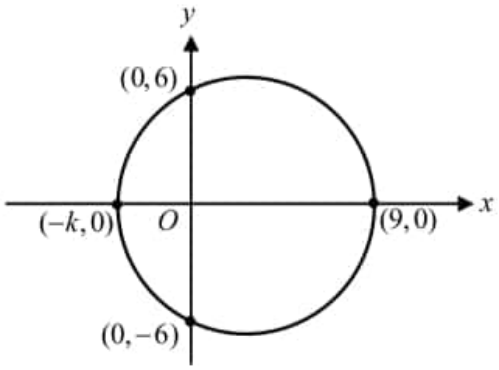
A) $9000\left(1+\frac{2}{12}\right)^{10} - 9000$

B) $9000\left(1+\frac{2}{120}\right)^{10} - 9000$

C) $9000\left(1+\frac{2}{120}\right)^{120} - 9000$

D) $9000\left(1+\frac{2}{1200}\right)^{120} - 9000$

11



The graph of a circle in the xy-plane above intersects at four points with the x-axis and the y-axis. What is the value of k?

A) 4

B) 5

C) 6

D) 7

12

If $f(x-3) = x^2 + x + 1$, which of the following represents $f(x)$?

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

B) $f(x) = (x-3)^2 + (x-3) + 1$

C) $f(x) = (x+3)^2 + (x+3) + 1$

D) $f(x) = (x+3)^2 + (x+3) + 3$

CONTINUE

13

If $3p+5\le 15$, what is the greatest possible value of $6p-5$?

A) 15

B) 25

C) 35

D) 85

14

Which of the following polynomials is divisible by $(x+1)$?

A) x^3-1

B) x^3-x^2-x-1

C) x^3+x^2-x+1

D) x^3+x^2-x-1

15

Week	1	2	3	4	5	6	7
Height (feet)	1.5	1.7	1.8	2.2	2.9	3.7	4.8

Students in a science class observed the growth of a plant over 7 weeks. The table above shows their observations. What is the average rate of change, in feet per week, of the plant from weeks 1 to 7?

A) 0.42

B) 0.47

C) 0.55

D) 0.58

16

Ashley and Bernard work at an electronic appliance store. Ashley is paid \$200 per week plus 5% of her total sales. Bernard is paid \$325 per week plus 2.5% of his total sales. If their weekly pay is the same, what is the dollar amount of their sales?

A) 5,000

B) 6,200

C) 7,500

D) 8,400

CONTINUE

17

How does the graph of $f(x) = x^2 - 4x + 5$ compare with the graph of $g(x) = x^2$?

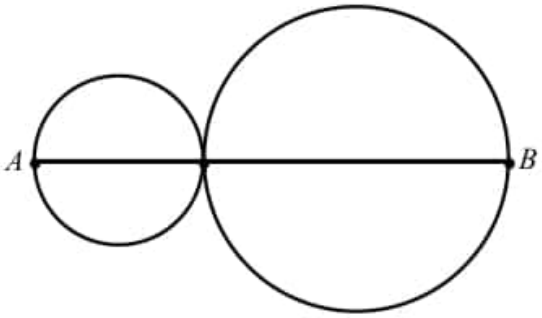
A) The graph of $g(x)$ is moved to the left 4 units and up 5 units.

B) The graph of $g(x)$ is moved to the right 4 units and up 5 units.

C) The graph of $g(x)$ is moved to the left 2 units and up 5 units.

D) The graph of $g(x)$ is moved to the right 2 units and up 1 unit.

18



In the figure above, the circles are tangent each other and the radii are in a ratio of 1:2. If the sum of their areas is 80π, what is the length of $\overline{AB}$?

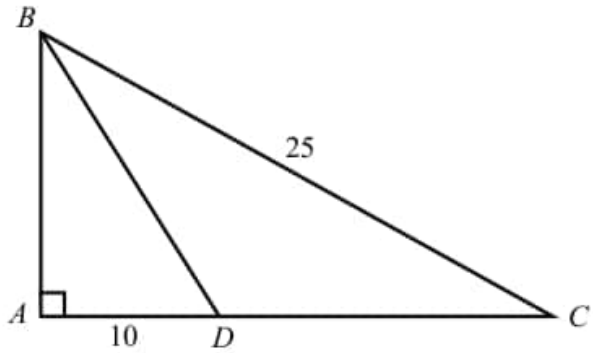
A) 12

B) 16

C) 18

D) 24

19



In right triangle ABC above, $AD = 10$ and $BC = 25$. If the value of $\sin \angle BCD$ is 0.6, what is the area of triangle BCD?

A) 50

B) 75

C) 100

D) 150

20

If $p = a^2 - 4a + 8$, what is the least possible value of $p + 6$?

A) 2

B) 4

C) 8

D) 10

CONTINUE

21

$$80 \le x \le 100$$
$$40 \le y \le 60$$

The intervals of x and y are shown above. If $z = x - y$, which of the following represents all possible values of z?

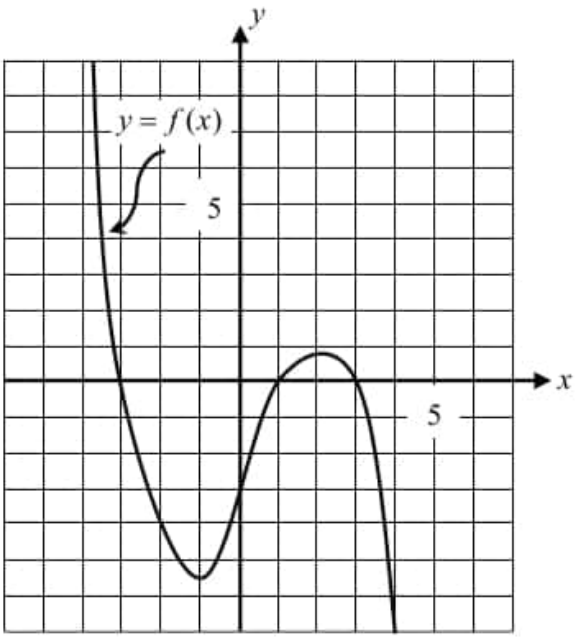
A) $|z - 40| \le 20$

B) $|z - 40| \ge 20$

C) $|z - 20| \le 40$

D) $|z - 20| \ge 40$

22



Which of the following functions could represent the graph of $f(x)$ shown in the xy-plane above?

A) $f(x) = \frac{1}{3}(x-3)(x^2 - 4x + 3)$

B) $f(x) = -\frac{1}{3}(x-3)(x^2 - 2x - 3)$

C) $f(x) = -\frac{1}{3}(x+3)(x^2 - 4x + 3)$

D) $f(x) = -\frac{1}{3}(x+3)(x^2 + 4x + 3)$

CONTINUE

23

$$f(x) = (x-4)^2 - 64$$

Which of the following is an equivalent form of the function above?

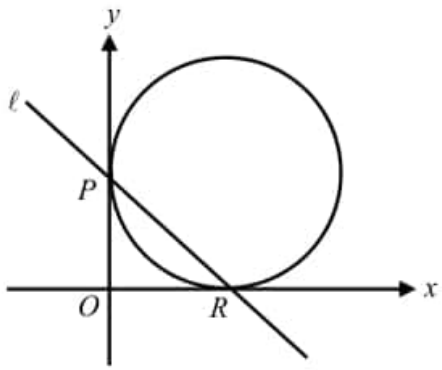
A) $f(x) = (x+3)(x-11)$

B) $f(x) = (x+6)(x-14)$

C) $f(x) = (x+4)(x-12)$

D) $f(x) = (x+6)(x-8)$

24



In the xy-plane above, a circle is tangent to the x-axis at R and the y-axis at P, and line ℓ passes through the points of tangency. If the area of the circle is 100π, what is the equation of line ℓ?

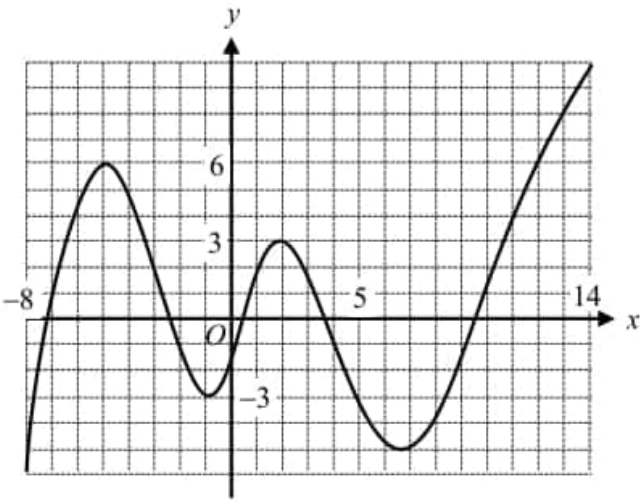
A) $y = -x + 5$

B) $y = -x + 10$

C) $y = -x + 50$

D) $y = -x + 100$

25



$y = f(x)$

$y = k$

In the system of equations above, k is a constant. The function $y = f(x)$ is shown in the xy-plane above for $-8 \le x \le 14$. On this closed interval, for how many values of k does the system have exactly 4 solutions?

A) 1

B) 2

C) 3

D) 4

26

Let the function f be defined by $f(x) = \sqrt{50 - 2x^2}$. What are all the values of x for which $f(x)$ is a real number?

A) $x \ge 5$

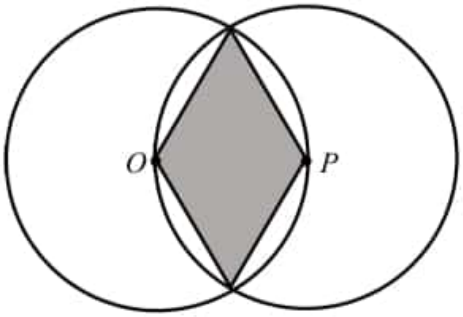
B) $x \le 5$

C) $-25 \le x \le 25$

D) $-5 \le x \le 5$

CONTINUE

27



In the figure above, O and P are the centers of the circles. If the lengths of radii of the circles are each 10, what is the area of the shaded region?

A) $50\sqrt{3}$

B) $25\sqrt{3}$

C) $\frac{25\sqrt{3}}{2}$

D) $\frac{25\sqrt{3}}{4}$

28

In the xy-plane, the graph of the function is a line with a slope of 5. If $f(a) = -4$ and $f(b) = 32$, what is the value of $b - a$?

A) 6

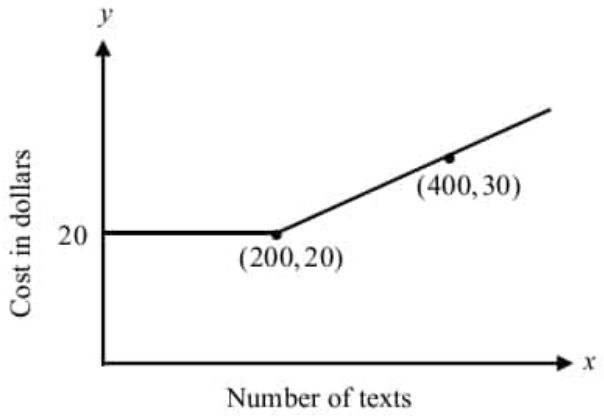
B) 7.2

C) 8

D) 8.4

CONTINUE

Questions 29 and 30 refer to the following information.



The domestic texting plan of an E-mobile telephone company is modeled by the graph in the xy-plane above.

29

Which of the following pairs of equations represents the graph of the domestic texting plan?

A) $\begin{cases} y = 20, & x \le 200 \\ y = 0.05x, & x > 200 \end{cases}$

B) $\begin{cases} y = 20, & x \le 200 \\ y = 20 + 0.05x, & x > 200 \end{cases}$

C) $\begin{cases} y = 20, & x \le 200 \\ y = 20 + 0.05(x - 200), & x > 200 \end{cases}$

D) $\begin{cases} y = 20, & x \le 200 \\ y = 30, & x > 200 \end{cases}$

30

If Jennifer uses 550 texts this month, what is her amount of money, in dollars, does she have to pay?

A) 20.00

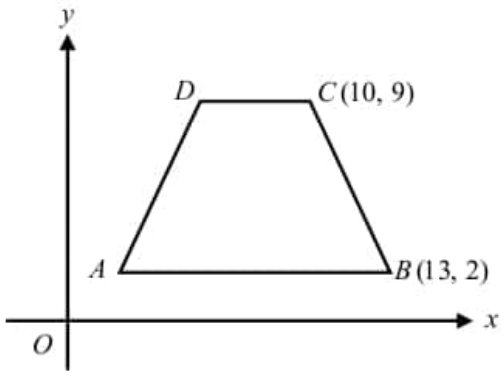
B) 25.00

C) 32.50

D) 37.50

CONTINUE

31

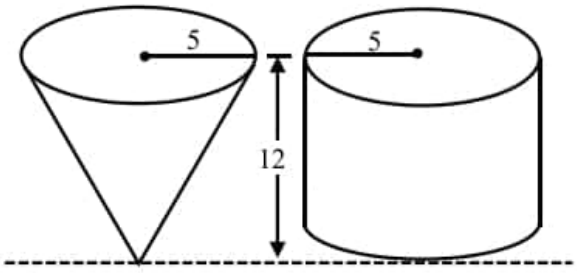


A trapezoid ADCB is in the xy-plane above. If $AD = BC$, what is the slope of $\overline{AD}$?

32

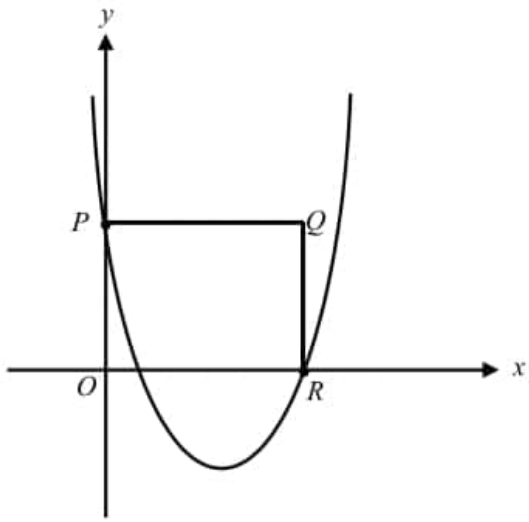
If a and b are positive integers such that $\frac{a}{b} = 0.48$. If $150 < b < 200$, what is the value of $a + b$?

33



In the figure above, the cylindrical and cone-shaped containers have the same height of 12 inches and the same radius of 5 inches. If the cone-shaped container filled with water and then the water is poured into the empty cylindrical container, what will be the depth, in inches, of the water in the cylindrical container?

34



Note: Figure not drawn to scale.

In the xy-plane above, the graph of $y = 2x^2 - 19x + 9$ intersects the y-axis at P and the x-axis at R. What is the area of rectangle $OPQR$?

35

$$y \geq x^2 - 8x$$
$$y \leq 2x$$

In the xy-plane, ordered pair (a, b) is the solution of the system of inequalities above. What is the maximum possible value of b?

CONTINUE

36

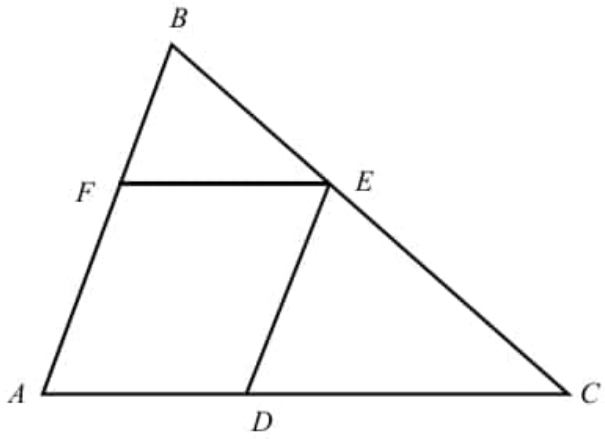
$$-6 \le x \le 20$$

If the interval above is rewritten in the form $|x-a| \le k$, what is the value of k?

37

Mr. Trump drove to work in the morning at the average speed of 60 miles per hour. He returned home in the evening along the same route and averaged 45 miles per hour. To the nearest tenth, what is his average speed, in miles per hour, for the entire trip?

38



In the figure above, quadrilateral $AFED$ is a parallelogram and $\frac{BE}{EC} = \frac{1}{2}$. If the area of the parallelogram is 10, what is the area of triangle ABC?

STOP

If you finish before time is called, you may check your work on this section only. Do not turn to any other section in the test.

Math Conversion Table			
Raw Score	**Scaled Score**	**Raw Score**	**Scaled Score**
58	800	**27**	500
57	800	**26**	490
56	800	**25**	480
55	800	**24**	470
54	790	**23**	460
53	780	**22**	460
52	770	**21**	450
51	750	**20**	440
50	740	**19**	430
49	730	**18**	430
48	720	**17**	420
47	710	**16**	420
46	700	**15**	410
45	690	**14**	400
44	670	**13**	390
43	680	**12**	380
42	670	**11**	370
41	660	**10**	360
40	650	**9**	450
39	640	**8**	340
38	630	**7**	330
37	620	**6**	310
36	610	**5**	290
35	600	**4**	280
34	590	**3**	270
33	580	**2**	260
32	560	**1**	240
31	550	**0**	200
30	540		
29	530		
28	520		

Answer Explanations

Test 10 Answers and Explanations										
SECTION 3	1	2	3	4	5	6	7	8	9	10
	C	C	B	D	C	C	B	B	D	D
	11	12	13	14	15	16	17	18	19	20
	C	D	B	A	D	4.5	75	30	50	15
SECTION 4	1	2	3	4	5	6	7	8	9	10
	A	B	B	A	B	C	B	B	C	D
	11	12	13	14	15	16	17	18	19	20
	A	C	A	D	C	A	D	D	B	D
	21	22	23	24	25	26	27	28	29	30
	A	C	C	B	C	D	A	B	C	D
	31	32	33	34	35	36	37	38		
	$\frac{7}{3}$	259	4	81	20	13	51.4	22.5		

SECTION 3

1. C

$2x-3=x \rightarrow x=3 \rightarrow 2x-3=3$

2. C

Put the numbers in the inequalities and check. $(-2,4) \rightarrow 2(-2)+4=0\le 3 \rightarrow (-1)-4=-5<-3$(OK)

3. B

$\frac{k}{100}(20,000\times 10)=2000k$

4. D

$\frac{100-k}{10}=\frac{100}{x} \rightarrow x=\frac{1000}{100-k}$. Or $(100-k)\%$ of $x=10 \rightarrow \frac{100-k}{100}x=10 \rightarrow x=\frac{1000}{100-k}$

5. C

Slope

6. C

$2x^2+12x-32=0 \rightarrow x^2+6x=16 \rightarrow x^2+6x+(9)=16+(9) \rightarrow (x+3)^2=25$

7. B

8. B

Since the date are not exactly on the line and are correlated negatively. The best answer is -0.95.

9. D

Substitution: $2x-3(x-4)=6 \rightarrow x=6$ and $y=6-4=2 \rightarrow (6, 2)$

10. D

11. C

First determine the value of a using $(0,5)$. $\rightarrow 5=a(0+1)(0-5) \rightarrow a=-1$

From the equation: Two zeros $x=-1$ and $5 \rightarrow h=\dfrac{-1+5}{2}=2$ and $k=-(2+1)(2-5)=9$

12. D

$3k=x^2-1 \rightarrow x^2=3k+1 \rightarrow 3x^2=9k+3$

13. B

$a+b+c=45$ and $a+b-c=5$ Addition: $2(a+b)=50 \rightarrow a+b=25$

14. A

$a(x+1)+b(x-1)=2(x-2)+1 \rightarrow (a+b)x+(a-b)=2x-3 \rightarrow a+b=2$ and $a-b=-3$

When you add these two equations: $2a=-1 \rightarrow a=-\dfrac{1}{2}$

15. D

$3(x-3)^2=20 \rightarrow (x-3)^2=\dfrac{20}{3} \rightarrow x-3=\pm\sqrt{\dfrac{20}{3}} \rightarrow x=3\pm\sqrt{\dfrac{60}{9}}=3\pm\dfrac{\sqrt{60}}{3}$

16. 4.5

$|x-5|\le\dfrac{1}{2} \rightarrow -\dfrac{1}{2}\le x-5\le\dfrac{1}{2} \rightarrow 4.5\le x\le 5.5 \rightarrow$ The least value is 4.5.

Or, just simply $5-\dfrac{1}{2}=4.5,$ because midpoint is 5.

17. 75

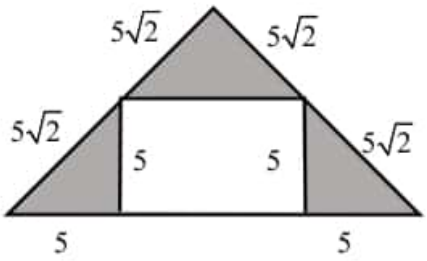
Since the diameter is increased by 100%, the radius also is increased by 100%. Therefore,

$\pi r^2h=\pi(2r)^2h' \rightarrow h'=\dfrac{r^2}{4r^2}h=\dfrac{1}{4}h=0.25h \rightarrow h'=(1-0.75)h$: 75% of the height will be decreased.

18. 30

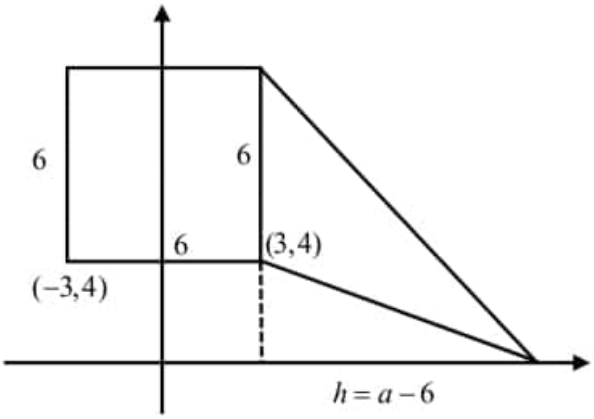
Axis of symmetry: $x=\dfrac{-(-20)}{2(1/2)}=20 \rightarrow$ 20 is the midpoint of 10 and x. $\rightarrow \dfrac{10+x}{2}=20 \rightarrow x=30$

19. 50



The area of the shaded region $= \frac{5\sqrt{2}\times 5\sqrt{2}}{2} + \frac{5\times 5}{2} + \frac{5\times 5}{2} = 50$

20. **15**



The area of the triangle $= \frac{6\times(a-3)}{2} = 36 \rightarrow a-3=12 \rightarrow a=15$

SECTION 4

1. A

Total amount will be $\$d + \left(\frac{300}{10}\right)\times\$\frac{c}{100} = \$\left(d + \frac{3c}{10}\right)$

2. B

Constant slope: Let the value of $f(6) = k$.

$(0, 3), (3, -8), (6, k) \rightarrow \text{slope} = \frac{-8-3}{3-0} = \frac{k-3}{6-0} \rightarrow 3k-9=-66 \rightarrow 3k=-57 \rightarrow k=-19$

3. B

When $x = 3,\ y = 8$.

4. A

When $x=3,\ f(3-5)=3^2-5 \ \rightarrow\ f(-2)=4.$

5. B

$\frac{1}{a}+\frac{1}{b}=\frac{a+b}{ab}=20 \ \rightarrow\ \frac{10}{ab}=20 \ \rightarrow\ ab=\frac{1}{2}$

6. C

The area of $\triangle AFD$ is exactly half of the area of the rectangle. Therefore, the area of the parallelogram is $12.5\times 2=25.$

7. B

Class Beta has the data closet to the mean. Class Gamma has a greatest standard deviation.
You can check using a calculator.

8. B

Each class has the same average score of 80.

9. C

$f(x)=x^2-8x+12=(x-4)^2-4 \ \rightarrow\ \text{vertex}\,(4,-4)$

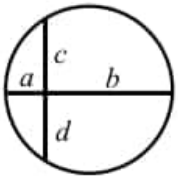
Move to the right by 3. $\rightarrow$ the vertex of $g(x)$ is $(7,-4).$

10. D

$A=p\left(1+\frac{r/100}{n}\right)^{nt}$ for annual interest of $r\%$. When $n=12$ and $r=2,$ $\text{Interest}=9000\left(1+\frac{2}{1200}\right)^{120}-9000.$

11. A

$9\times k=6\times 6 \ \rightarrow\ k=4$



$a\times b=c\times d$

12. C

Replace x with $x+3. \ \rightarrow\ f\left((x+3)-3\right)=(x+3)^2+(x+3)+1$

13. A

$3p+5\le 15 \ \rightarrow\ 3p\le 10 \ \rightarrow 6p\le 20 \ \rightarrow 6p-5\le 20-5 \ \rightarrow 6p-5\le 15$

Therefore, the greatest possible value is 15.

14. D (Factor Theorem)

When you putting $x=-1,$ only choice D results in 0. $(-1)^3+(-1)^2-(-1)-1=-1+1+1-1=0$

15. C

$\text{Average rate of change}=\text{Slope}=\frac{4.8-1.5}{7-1}=0.55 \text{ feet/week}$

16. A

$200 + 0.05s = 325 + 0.025s \rightarrow 0.025s = 125 \rightarrow s = \$5{,}000$

17. D

$f(x) = x^2 - 4x + 5 \rightarrow f(x) = (x-2)^2 + 1 \rightarrow f(x) = g(x-2) + 1$ means: move to the right by 2 and up by 1.

18. D

The ratio of corresponding sides $= 1:2 \rightarrow$ the ratio of areas $= 1:4$. Let the areas of the circles be k and $4k$, then $k + 4k = 5k = 80\pi \rightarrow k = 16\pi\ (= \pi r_1^2)$ and $4k = 64\pi (= \pi r_2^2) \rightarrow$ Therefore, $r_1 = 4$ and $r_2 = 8$.

19. B

$AB = 25 \sin \angle BCD = 25 \times 0.6 = 15 \rightarrow AC = \sqrt{25^2 - 15^2} = \sqrt{400} = 20 \rightarrow CD = 20 - AD = 10$

Therefore, the area of $\triangle BCD = \dfrac{10 \times 15}{2} = 75$.

20. D

$p = a^2 - 4a + 8 = (a-2)^2 + 4 \rightarrow$ The minimum of p is 4. $\rightarrow$ The minimum of $p+6$ is $4 + 6 = 10$.

21. A

$20 \le x - y \le 60 \rightarrow$ mid point $= \dfrac{20+60}{2} = 40$, the distance from mid point to the end point is $60 - 40 = 20$.

Therefore, $|z - \text{midpoint}| \le \text{distance} \rightarrow |z - 40| \le 20$

22. C

$\dfrac{1}{3}(x+3)(x^2 - 4x + 3) = 0 \rightarrow (x+3)(x-1)(x-3) = 0 \rightarrow$ zeros $x = -3, 1, 3$

23. C

$f(x) = (x-4)^2 - 64 = x^2 - 8x + 16 - 64 = x^2 - 8x - 48 \rightarrow f(x) = (x+4)(x-12)$

24. B

$\pi r^2 = 100\pi \rightarrow r = 10 \rightarrow OP = OR = 10 \rightarrow \text{Slope} = -\dfrac{10}{10} = -1 \rightarrow$ Therefore, $y = -x + 10$.

25. C

$y = 3$ and $y = -3$ have exactly 4 points of intersection with $y = f(x)$.

26. D

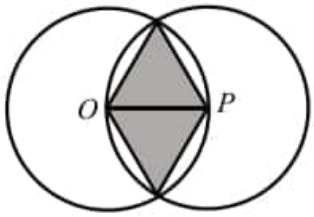
$50 - 2x^2 \ge 0 \rightarrow x^2 - 25 \le 0 \rightarrow (x+5)(x-5) \le 0 \rightarrow -5 \le x \le 5$

27. A

$OP = 10$

Area of an equilateral triangle is $\frac{s^2\sqrt{3}}{4}$.

Therefore, the area of the shades region is $\frac{10^2\sqrt{3}}{4} \times 2 = 50\sqrt{3}$



28. B

$\text{Slope} = \frac{f(b)-f(a)}{b-a} = 5 \rightarrow \frac{32-(-4)}{b-a} = 5 \rightarrow \frac{36}{b-a} = 5 \rightarrow b-a = 7.2$

29. C

When $x > 200$, $y = 20 + 0.05(x - 200)$

30. D

$y = 20 + 0.05(550 - 200) = 20 + 17.5 = \$37.5$

31. $\frac{7}{3}$

The slop of $\overline{BC} = \frac{9-2}{10-13} = \frac{7}{-3}$. Therefore, the slope of $\overline{AD}$ is $\frac{7}{3}$.

32. 259

$\frac{a}{b} = \frac{48}{100} = \frac{12}{25} \rightarrow$ Let $a = 12k$ and $b = 25k \rightarrow 150 < 25k < 200 \rightarrow 6 < k < 8 \rightarrow k = 7$

Therefore, $a = 12 \times 7 = 84$ and $b = 25 \times 7 = 175. \rightarrow a + b = 259$

33. 4

$\frac{\pi(5^2)(12)}{3} = \pi(5^2)h \rightarrow h = 4$

34. 81

If $x = 0, y = 9. \rightarrow P(0, 9)$ For x-intercept, $0 = 2x^2 - 19x + 9 = (2x - 1)(x - 9) \rightarrow x = \frac{1}{2}, 9$

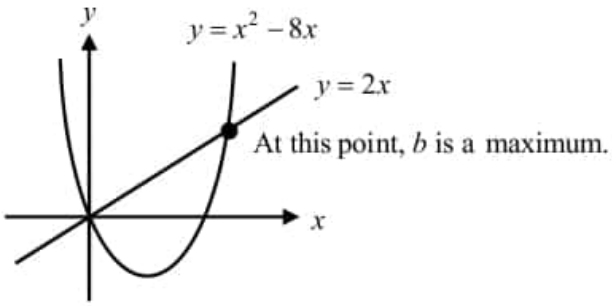
Therefore, the area of the rectangle is $8 \times 8 = 81$.

35. 20

$x^2 - 8x = 2x \rightarrow x^2 - 10x = 0$

$\rightarrow x(x - 10) = 0 \rightarrow x = 0, 10$

$b = 2a \rightarrow b = 2 \times 10 = 20$



36. 13

$a = \frac{-6+20}{2} = 7 \rightarrow k = 20 - 7 = 13$

37. 51.4

Let distance $= 180$ miles. Average speed $\dfrac{\text{Total distance}}{\text{Total time}} = \dfrac{180+180}{180/60+180/45} = 51.42857\cdots \approx 51.4$

38. 22.5

The ratio of areas $\triangle BEF : \triangle ECD : \triangle ABC = 1^2 : 2^2 : 3^2 = 1:4:9$, because the ratio of corresponding sides is 1:2:3.

Let the areas of $\triangle BEF = k$, $\triangle ECD = 4k$, and $\triangle ABC = 9k$.

$9k - k - 4k = 4k = 10 \quad \rightarrow \quad k = 2.5 \quad \rightarrow \quad$ Area of $\triangle ABC = 9k = 9 \times 2.5 = 22.5$