Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

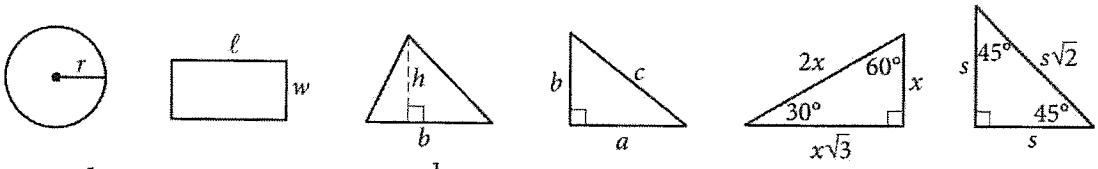
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



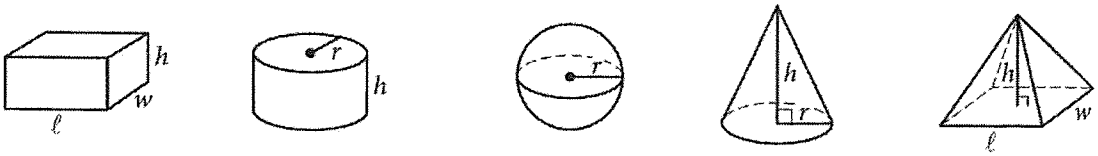
$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

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

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

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 sum of the measures in degrees of the angles of a triangle is 180.

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction (7/2) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE

1

$x - a$ is one of the factors of $3x^3 + 15x^2 - 42x$, where a is a positive constant. What is the value of a?

A) 2
B) 3
C) 7
D) 42

2

Fitness class size	Frequency
10	20
12	18
15	10
20	7
22	5

The table above shows the distribution of 60 fitness classes size in a certain metropolitan area. What is the positive difference between the median and the mean of the data?

A) 3.6
B) 2.6
C) 1.6
D) 1.4

3

$$KE = \frac{1}{2} I\omega^2$$

The equation above shows the formula for the rotational kinetic energy (KE), where I is a rotational inertia and ω is an angular speed. If I is quadrupled and ω is halved, how does the change affect to the rotational kinetic energy, KE?

I) No effect on KE.
J) KE will be doubled.
K) KE will be $\frac{1}{2}$ times.
L) KE will be 4 times.

4

Demographic scientist observed and interviewed the visitors to a certain shopping mall to study the characteristics of customers in a holiday. $\frac{6}{13}$ are females, $\frac{1}{5}$ are children, and $\frac{2}{7}$ are from other cities. Based on the result of survey, what number could be the total number of visitors to the shopping mall on that day?

A) 450
B) 453
C) 455
D) 458

5

Michelle hosts a party for graduation. She found out that one $2l$ bottle of soda can serve 8 people, one large bag of chips can serve 4 people, and one box of assorted bread can serve 12 people. If total sum of the number of sodas, large bag of chips, and box of assorted bread is 77, how many people will be at her graduation party?

A) 160
B) 162
C) 165
D) 168

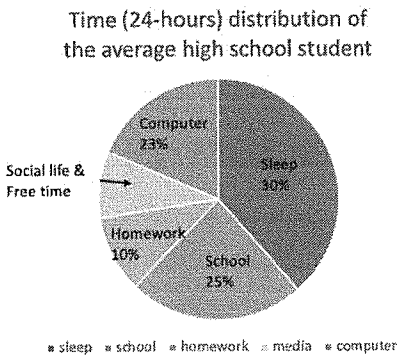
6

$$\left(\frac{1}{a}\right)^{x^2+2x-1} = (a^x)^{-2}$$

In the equation above, what is the absolute value of the difference of two x $values, where$ a is a positive constant?

M) -2
N) 2
O) 0
P) 1

7



The circle graph shows how the average high school student spends their time 24-hours a day. Based on the graph, how many hours does the average high school student spend for social life and free time?

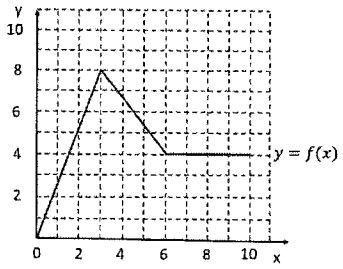
A) 2.22
B) 2.88
C) 3.02
D) 3.88

8

Julia is standing near the light post. She is 182cm tall and she is 4m away from the light post. If the height of the light post is 6m, what is the length of the shadow, in meters, of Julia? (1m = 100cm)

A) 174.16
B) 574.16
C) 1.74
D) 5.74

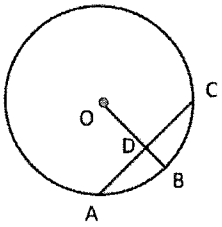
9



The figure above shows the complete graph of $y = f(x)$ in the XY-plane. The function h $(not\ shown)$ is defined by $h(x) = f(x) - 3$. What is the maximum value of the function h?

A) 4
B) 5
C) 6
D) 8

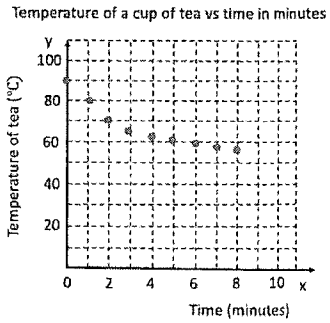
10



In the circle O above, the radius of a circle O is 8. If the length of BD is 2, what is the length of AC?

A) $2\sqrt{7}$
B) $4\sqrt{7}$
C) 20
D) 10

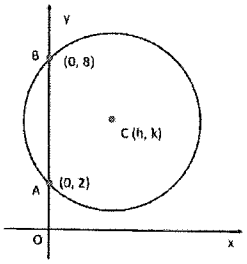
11



In the dot plots above, it shows the temperature profile of a cup of tea over time after the cup is removed from a heat source and then left it in a room that is kept at a constant temperature. Which of the following best approximate the temperature, in °C, when it is just removed from the heat source?

A) 60
B) 70
C) 80
D) 90

12



In the circle graph above, the center of the circle is C (h, k) and the radius of the circle is 5, what is the value of h?

A) 3
B) 4
C) 5
D) 6

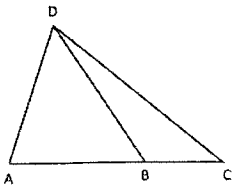
CONTINUE

13

	Short track distance			
Gender	500m	1,000m	1,500m	3,000m
Male	23	11	9	20
Female	18	x	7	15

The table above shows the distribution of the number of Olympic short track athletes by various distances and gender in a certain country. If one of the female athletes was chosen at random, the probability that the athlete runs for 1,000m is $\frac{1}{5}$, what is the value of x?

14



In the figure above, $\overline{AB} = 2.5\overline{BC}$. If the area of triangle ABD is 30, what is the area of triangle BCD?

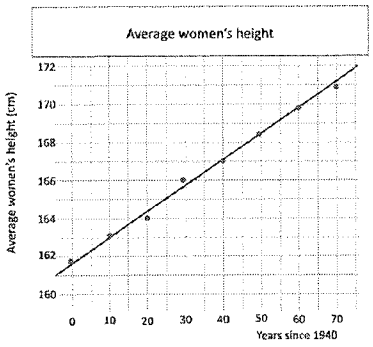
A) 10
B) 11
C) 12
D) 14

15

$$x = 3$$
$$|y - 2| = x$$

In the system of equations above, what is the sum of y values of the solutions to the system?

16



The scatter plot shows the average women's height, in centimeters, in a certain country since 1940s. A line of best fit is shown on the graph and its equation is $y = 0.133x + 161.67$, where x is the number of years after 1940. what does the line of best fit predict about the increase over the 70-year period?

A) Every 10 years between 1940 and 2010, the average increase in women's height in that specific country is 0.133cm.
B) For 10 years between 1940 and 2010, the total increase in women's height in that specific country is 161.67cm.
C) Every year between 1940 and 2010, the average increase in women's height in that specific country is 0.133cm.
D) Every year between 1940 and 2010, the average increase in women's height all over the world is 0.133cm.

17

If $f(x) = \frac{3}{4}x^2 + 1$ and $f(x - a) = \frac{3}{4}x^2 + 3x + 4$, what is the value of a?

A) -2
B) 2
C) -1
D) 1

18

An oceanologist detected a sunken ship 4.5 miles below the ocean's surface by radar. Approximately, how many kilometers below the ocean's surface was the sunken ship located? (1 kilometer = 0.6214 miles)

A) 2.80
B) 6.24
C) 7.24
D) 8.24

19

$$\frac{1}{3x - 4} + 2$$

Which of the following is equivalent to the expression above, where $x > 2$?

A) $\frac{6x-8}{3x-4}$
B) $\frac{3}{3x-4}$
C) $\frac{6x-7}{3x-4}$
D) $\frac{6x-6}{3x-4}$

20

$$(4x^2 - ax + 1)(bx - 3)$$

The expression above is equivalent to $28x^3 - 19x^2 + 10x - 3$ for all x, where a and b are constants. What is the value of $a + b$?

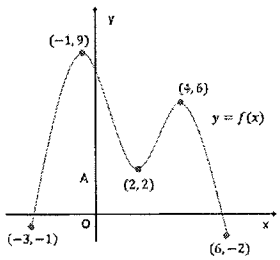
A) 7
B) 8
C) 9
D) 10

21

A math teacher scored 55 students' math exam. The teacher calculated class mean, median, range, and standard deviation of 55 scores. Later he found out that the highest score was mistakenly 2 points lower than it should have been. Which of the following remains unchanged if the teacher uses the corrected score?

A) Mean
B) Median
C) Range
D) Standard deviation

22



The complete function f is graphed in the XY-plane above. There is another function, $y = a$, where a is a constant (not shown). Which of the following could be the value of a if the system of two functions has three real solutions?

A) 1
B) 3
C) 5
D) 6

STOP

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