# 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.
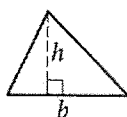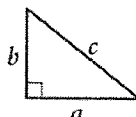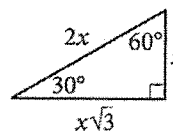
REFERENCE
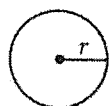
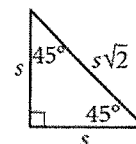$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

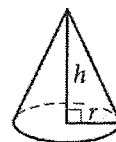$A = \frac{1}{2} bh$
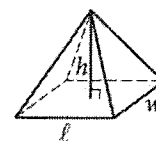
$c^2 = a^2 + b^2$

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.

1

Average number of hours weekly spent in leisure time
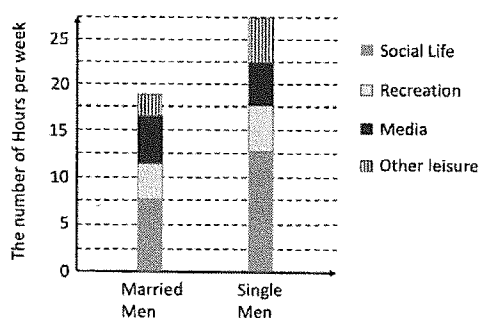
In the bar graph above, which of the following statements interprets correctly?

I. The percent of weekly time spent on Media for both married men and single men are same.
II. The percent of weekly time spent on Recreation for Married Men is higher than that of single men.
III. The number of weekly hours spent on recreation, media, and other leisure for married men is lower than the number of weekly hours spent on social life for single men.

A) I only
B) I and II only
C) II only
D) II and III

2
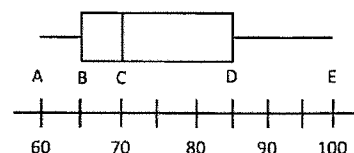
Calculus final exam score distribution

In the boxplot above, which of the followings are valid statements?

I. There must be more data between C and D than between B and C.
II. There are approximately 50% of data located A and C.
III. There are approximately 50% of data located between B and D.

A) I only
B) I and III only
C) II and III only
D) I, II, and III

3

Which of the following expressions is equivalent to $\left(\sqrt{4x} + \sqrt{16y}\right)^{\frac{2}{5}}$, where $x, y > 0$?
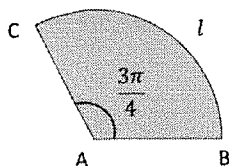
A) $\sqrt[5]{4x + 16y}$
B) $(4x + 16y)^5$
C) $\sqrt[5]{4x + 16y + 16\sqrt{xy}}$
D) $\sqrt[5]{4x + 16y + 8\sqrt{xy}}$

237

4

The function f is defined by $f(x) = -2(3)^{\frac{x}{5}} - 6$. What is the coordinate of y-intercept of the graph it is graphed in the XY-plane?

A) (-12, 0)
B) (-8, 0)
C) (0, -6)
D) (0, -8)

5

In the sector ABC of a circle above, if the central angle CAB is $\frac{3}{4}\pi$ as shown, what is the fraction of the length of an arc (l) to the entire circumference of the circle A?

A) $\frac{13}{32}$

B) $\frac{3}{8}$

C) $\frac{1}{3}$

D) $\frac{7}{16}$

6

Susan plans her birthday party and orders for foods. There will be no more than 50 people in the party. The food catering restaurant charges $25 per adult and $20 per child and her budget is limited to $1,200. If the number of adults is a and the number of children is c and no other charges, which of the following systems best represents all constraints mentioned above?

A) $\begin{cases} a + c \le 50 \\ 25a + 20c \le 1{,}200 \end{cases}$

B) $\begin{cases} a + c > 50 \\ 25a + 20c \le 1{,}200 \end{cases}$

C) $\begin{cases} a + c \le 50 \\ 20a + 25c \le 1{,}200 \end{cases}$

D) $\begin{cases} a + c < 50 \\ 25a + 20c > 1{,}200 \end{cases}$

7

If $x + y = 17$ and $xy = 24$, what is the value of $x^2 + y^2$?

A) 265
B) 241
C) 313
D) 337

CONTINUE

8

The average (arithmetic mean) of five numbers is 12. After one of the numbers is removed, the average of the remaining numbers becomes 13.5. What number has been removed?

A) 6
B) 8
C) 10
D) 12

9

If sixty eight percent of the people who made it to the final round in a certain competition are female, what is the ratio of the number of males who made it to the final round to the number of females who made it to the final round?

A) $\frac{8}{25}$

B) $\frac{17}{25}$

C) $\frac{8}{17}$

D) $\frac{25}{8}$

10

If the ratio of the measures of angles in a triangle is 4:5:6, what is the measure of the largest angle, in degrees, in the triangle?

A) 48°
B) 60°
C) 72°
D) 120°

11

$$y < -4x - 2$$
$$y < -\frac{1}{4}x - 2$$

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

Q) $(0, 0)$
R) $(-3, -1)$
S) $(-1, -5)$
T) $(3, 0)$

CONTINUE

12

A wooden stick of length l inches is cut into two pieces such that the length of one piece is 2 inches more than twice the length of the other piece. Which of the following is the length, in inches, of the longer piece in term of l?

A) $\dfrac{2+l}{3}$

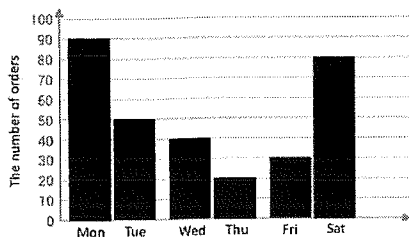B) $\dfrac{2+2l}{3}$

C) $\dfrac{1+l}{3}$

D) $\dfrac{2l+1}{3}$

14

$$(2-x)^2 - (2-x) + 11 = 0$$

In the equation above, how many distinct real solutions does the equation have?

A) Zero
B) One
C) Two
D) Infinitely many

13

The bar graph shows the number of orders per day on a local pick-up restaurant last week. For these six days, how much greater is the mean number of orders per day than the median number of orders per day?

A) 31.67
B) 21.67
C) 11.67
D) 6.67

15

$$-x^2 + 6x - y^2 - 4y - k = 0$$

In the circle equation above, what is the value of k in the equation to have 7 as a radius of the circle?

A) -36
B) 36
C) 6
D) -6

16

$$Q = mc\Delta T$$

The equation above shows how much energy (Q), in joules, required to raise the temperature of water from T_1 to T_2 (ΔT), in degree Celsius, of m grams of water, where c is specific heat capacity of water. If the specific heat capacity of water (c) is $4.2\frac{J}{g \cdot °C}$, about how much energy, in joules, is required to raise the temperature of 2.0 grams of water from 18°C to 21°C?

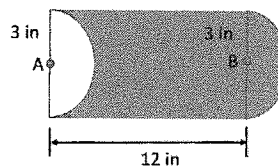A) 16.8
B) 12.6
C) 25.2
D) 33.6

17

$$\left(-x - \frac{1}{3}\right)(mx + 1) - 3x^2 + 1$$

In the equation above, m is a constant. If the expression is equal to k, where k is a constant, what is the value of $k - m$?

A) $\frac{7}{3}$

B) $\frac{11}{3}$

C) $-\frac{7}{3}$

D) $-\frac{11}{3}$

18

3 in   A   3 in   B

12 in

In the figure above, two semi-circles, A and B, with 3 inches radii and a rectangle with 12 inches in length are shown. What is the area of the shaded region, in square inches?

A) $36 - 9\pi$
B) $72 - 9\pi$
C) 36
D) 72

19

$$\left(\frac{1}{x} + \frac{1}{y}\right)^2$$

For $x, y \neq 0$, if $x^2 + y^2 = 70$ and $xy = 6$, what is the value of the expression shown above?

E) $\frac{41}{18}$

F) $\frac{19}{9}$

G) $\frac{18}{41}$

H) $\frac{9}{19}$

20

$$m = \frac{a+b}{2}$$
$$n = \frac{a+c}{2}$$
$$k = \frac{b+c}{2}$$

In the equations above, $a, b, and\ c$ are positive constants. If $m > n > k$, which of the following inequalities is true?
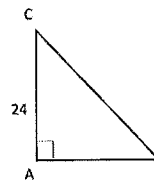
A) $a > c > b$
B) $c > b > a$
C) $a > b > c$
D) $b > a > c$

22

In the right triangle ABC above, if $cos\angle B = 0.5$, what is the value of $tan\angle C$?

A) $\frac{\sqrt{3}}{3}$

B) $\frac{\sqrt{3}}{24}$

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

D) $\sqrt{3}$

21

$$f(x) = -\frac{x^2}{3} + 2x - l$$

In the quadratic equation above, where l is a constant. What is the value of c if $f(c) = f(5)$?

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.

CONTINUE