Dr. John Chung's SAT Math

SAT

TEST
2

ANSWER SHEET   TEST #:

SECTION 3

1 (A)(B)(C)(D)(E)	11 (A)(B)(C)(D)(E)	21 (A)(B)(C)(D)(E)	31 (A)(B)(C)(D)(E)	
2 (A)(B)(C)(D)(E)	12 (A)(B)(C)(D)(E)	22 (A)(B)(C)(D)(E)	32 (A)(B)(C)(D)(E)	
3 (A)(B)(C)(D)(E)	13 (A)(B)(C)(D)(E)	23 (A)(B)(C)(D)(E)	33 (A)(B)(C)(D)(E)	
4 (A)(B)(C)(D)(E)	14 (A)(B)(C)(D)(E)	24 (A)(B)(C)(D)(E)	34 (A)(B)(C)(D)(E)	
5 (A)(B)(C)(D)(E)	15 (A)(B)(C)(D)(E)	25 (A)(B)(C)(D)(E)	35 (A)(B)(C)(D)(E)	
6 (A)(B)(C)(D)(E)	16 (A)(B)(C)(D)(E)	26 (A)(B)(C)(D)(E)	36 (A)(B)(C)(D)(E)	
7 (A)(B)(C)(D)(E)	17 (A)(B)(C)(D)(E)	27 (A)(B)(C)(D)(E)	37 (A)(B)(C)(D)(E)	
8 (A)(B)(C)(D)(E)	18 (A)(B)(C)(D)(E)	28 (A)(B)(C)(D)(E)	38 (A)(B)(C)(D)(E)	
9 (A)(B)(C)(D)(E)	19 (A)(B)(C)(D)(E)	29 (A)(B)(C)(D)(E)	39 (A)(B)(C)(D)(E)	
10 (A)(B)(C)(D)(E)	20 (A)(B)(C)(D)(E)	30 (A)(B)(C)(D)(E)	40 (A)(B)(C)(D)(E)	

SECTION 5

1 (A)(B)(C)(D)(E)	11 (A)(B)(C)(D)(E)	21 (A)(B)(C)(D)(E)	31 (A)(B)(C)(D)(E)	
2 (A)(B)(C)(D)(E)	12 (A)(B)(C)(D)(E)	22 (A)(B)(C)(D)(E)	32 (A)(B)(C)(D)(E)	
3 (A)(B)(C)(D)(E)	13 (A)(B)(C)(D)(E)	23 (A)(B)(C)(D)(E)	33 (A)(B)(C)(D)(E)	
4 (A)(B)(C)(D)(E)	14 (A)(B)(C)(D)(E)	24 (A)(B)(C)(D)(E)	34 (A)(B)(C)(D)(E)	
5 (A)(B)(C)(D)(E)	15 (A)(B)(C)(D)(E)	25 (A)(B)(C)(D)(E)	35 (A)(B)(C)(D)(E)	
6 (A)(B)(C)(D)(E)	16 (A)(B)(C)(D)(E)	26 (A)(B)(C)(D)(E)	36 (A)(B)(C)(D)(E)	
7 (A)(B)(C)(D)(E)	17 (A)(B)(C)(D)(E)	27 (A)(B)(C)(D)(E)	37 (A)(B)(C)(D)(E)	
8 (A)(B)(C)(D)(E)	18 (A)(B)(C)(D)(E)	28 (A)(B)(C)(D)(E)	38 (A)(B)(C)(D)(E)	
9 (A)(B)(C)(D)(E)	19 (A)(B)(C)(D)(E)	29 (A)(B)(C)(D)(E)	39 (A)(B)(C)(D)(E)	
10 (A)(B)(C)(D)(E)	20 (A)(B)(C)(D)(E)	30 (A)(B)(C)(D)(E)	40 (A)(B)(C)(D)(E)	

Grid-in answer boxes numbered 9, 10, 11, 12, 13 (top row) and 14, 15, 16, 17, 18 (bottom row), each with four columns of bubbles 0–9.

Math Scoring Worksheet

A. Section 3

　　＿＿＿＿＿＿　　　＿＿＿＿＿＿
　　numer of correct　　*number of incorrect*

　　+　　　　　　　　+

B. Section 5 (1-8)

　　＿＿＿＿＿＿　　　＿＿＿＿＿＿
　　numer of correct　　*number of incorrect*

　　+

C. Section 5 (9-18)

　　＿＿＿＿＿＿
　　numer of correct

　　+　　　　　　　　+

D. Section 7

　　＿＿＿＿＿＿　　　＿＿＿＿＿＿
　　numer of correct　　*number of incorrect*

　　=　　　　　　　　=

E. Total Unrounded Raw Score

　　＿＿＿＿＿＿ − ＿＿＿＿＿＿ ÷4 = ＿＿＿＿＿＿
　　numer of correct　　*number of incorrect*

F. Total Rounded Raw Score ＿＿＿＿＿ (See table)

Math Score Range = [＿＿＿]

Math Conversion Table

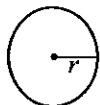| Raw Score	Scaled Score	Raw Score	Scaled Score
54	800	23	490-550
53	780-800	22	480-540
52	760-800	21	470-530
51	740-800	20	460-520
50	720-780	19	450-510
49	700-760	18	450-510
48	690-750	17	440-500
47	680-740	16	430-490
46	670-730	15	420-480
45	660-720	14	420-480
44	650-710	13	410-470
43	650-710	12	400-460
42	640-700	11	390-450
41	630-690	10	380-440
40	620-680	9	390-430
39	610-670	8	380-420
38	610-670	7	370-410
37	600-660	6	360-400
36	590-650	5	340-380
35	580-640	4	320-370
34	570-630	3	310-360
33	560-620	2	300-350
32	560-620	1	270-320
31	550-610	0	240-300
30	540-600	-1	200-290
29	530-590	-2	200-270
28	530-590	-3	200-260
27	520-580	-4	200-240
26	510-570	-5	200-220
25	500-560	-6 and below	200
24	500-560		

Turn to Section 3 (Page 1) of your answer sheet to answer the questions in this section.

Directions: For this section, solve each problem and decide which is the best of the choices given. Fill in the corresponding circle on the answer sheet. You may use any available space for scratchwork.
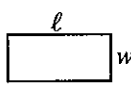
Notes

1. The use of a calculator is permitted.
2. All numbers used are real numbers.
3. Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not drawn to scale. All figure lie in a plane unless other indicated.
4. Unless otherwise specified, the domain of any function f is assumed to be set of all real numbers x for which $f(x)$ is a real number.
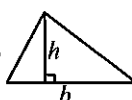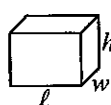
Reference Information

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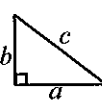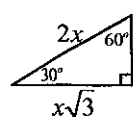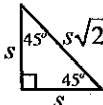$C = 2\pi r$

$A = \ell w$

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

$V = \ell w h$

$V = \pi r^2 h$

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

Special Right Triangles

The numbers of degrees of arc in a circle is $360°$.

The sum of the measures in degrees of the angles is $180°$.

1. If $3(a + 2b - c) = 12$, what is the value of $a + 2b$ in terms of c?

(A) $3c - 4$
(B) $c - 12$
(C) $c - 4$
(D) $4 + c$
(E) $12 - c$

$$\begin{array}{r} XY \\ + YX \\ \hline 88 \end{array}$$

2. In the addition problem above, X and Y are distinct positive integers. How many different integer values of X are possible?
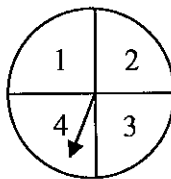
(A) 4   (B) 5   (C) 6   (D) 7   (E) 8

GO ON TO THE NEXT PAGE

3. A *clever integer* is defined as an integer that is greater than 20, less than 100, and such that the sum of its digits is 9. What fraction of all clever integers is divisible by 27?

(A) $\dfrac{1}{8}$

(B) $\dfrac{1}{4}$

(C) $\dfrac{3}{8}$

(D) $\dfrac{1}{2}$

(E) $\dfrac{5}{8}$

4. If $8^n \times 4^2 = 2^{10}$, what is the value of n ?

(A) 2
(B) 3
(C) 4
(D) 5
(E) 6

5. In the figure above, a player spins the arrow twice. Let the number of the first spin be p where the arrow stops, and the number of the second spin be q where the arrow stops. If each number has an equal probability of being the sector on which the arrow stops, what is the probability that the fraction $\dfrac{p}{q}$ is greater than or equal to 1?

(A) $\dfrac{1}{4}$

(B) $\dfrac{3}{16}$

(C) $\dfrac{5}{16}$

(D) $\dfrac{1}{2}$

(E) $\dfrac{5}{8}$

6. If $n = 4p^2q$, where p and q are distinct prime numbers, and not equal to 2, how many factors does the number n have?
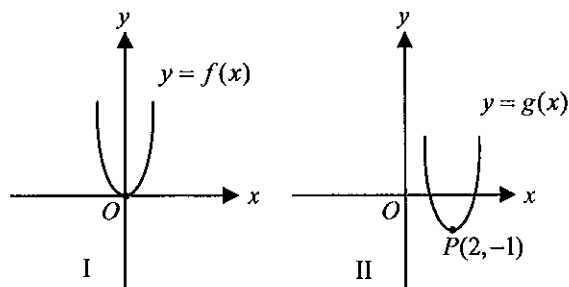
(A) 20
(B) 18
(C) 16
(D) 14
(E) 12
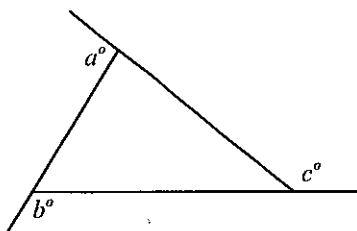
Note: Figure not drawn to scale.

7. In the figure, the angles a, b, and c represent exterior angles of the triangle. What is the value of $a+b+c$?

(A) 180
(B) 240
(C) 300
(D) 360
(E) 540

8. The graphs of f and g are shown above. If the equation in figure I is $y = x^2$, which of the following could be the equation of g in figure II?

(A) $g(x) = x^2 - 2$
(B) $g(x) = (x+2)^2 + 1$
(C) $g(x) = (x-2)^2 - 1$
(D) $g(x) = (x+2)^2 - 1$
(E) $g(x) = x^2 - 2x - 1$

9. On a farm, the ratio of cows to goats is 1:2 and the ratio of goats to pigs is 4:5. What is the ratio of cows to pigs?

(A) 1:2
(B) 1:4
(C) 2:5
(D) 1:6
(E) 2:7

10. The area of a sector is directly proportional to the square of the radius. When the value of the radius is 4, the area is 20. If the area is 45, what is the value of the radius?
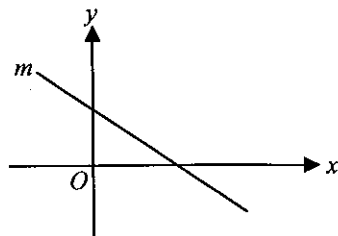
(A) 4
(B) 6
(C) 8
(D) 10
(E) 12

GO ON TO THE NEXT PAGE
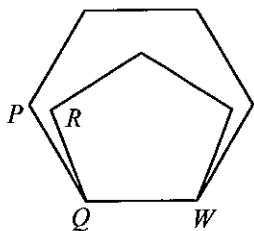
11. If the figure above shows a regular pentagon and a regular hexagon with a common side $\overline{QW}$, what is the value of $\angle PQR$?

(A) $12°$
(B) $20°$
(C) $22°$
(D) $24°$
(E) $30°$

12. Cathy can do a job in 8 hours while Danny can do the same job in 6 hours. If Cathy and Danny work three hours, what fraction of the job is left to be finished?

(A) $\dfrac{1}{12}$

(B) $\dfrac{1}{8}$

(C) $\dfrac{1}{7}$

(D) $\dfrac{1}{6}$

(E) $\dfrac{1}{4}$

13. The figure above shows the graph of $ax + by + c = 0$. Which of the following could be true?

I. $\dfrac{a}{b} > 0$

II. $\dfrac{c}{b} > 0$

III. $\dfrac{c}{b} < 0$

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

14. If X is the set of multiples of 5, and Y is the set of three-digit positive integers which are multiples of 7, how many numbers are common to both sets?
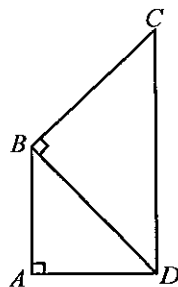
(A) Five
(B) Twenty
(C) Twenty five
(D) Twenty six
(E) Thirty

GO ON TO THE NEXT PAGE

15. What is p percent of q divided by q percent of p?

(A) 1

(B) pq

(C) $\dfrac{p}{q}$

(D) $\dfrac{q}{p}$

(E) $\dfrac{100}{pq}$

17. The figure above shows two isosceles right triangles. If the length of $\overline{BC}$ is $2a$, what is the perimeter of the quadrilateral $ABCD$ in terms of a?

(A) $2a + 4a\sqrt{2}$
(B) $3a + a\sqrt{2}$
(C) $4a + 4a\sqrt{2}$
(D) $4a + a\sqrt{3}$
(E) $5a$

16. In a plane, the distance between points X and Y is 10, the distance between points X and p is 3, and the distance between points Y and q is 4. Which of the following CANNOT be the length of $\overline{pq}$?

(A) 2
(B) 3
(C) 10
(D) 15
(E) 17
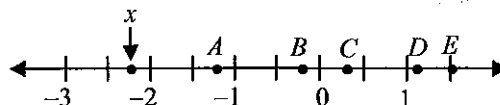
18. If x is the coordinate of the indicated point on the number line above, which of the following points represents the coordinate of $\left|\dfrac{x}{5}\right|$?

(A) A
(B) B
(C) C
(D) D
(E) E

GO ON TO THE NEXT PAGE
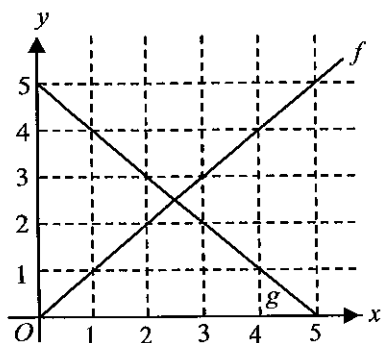
19. The figure above shows the graphs of the functions f and g. If $f\big(g(x)\big) = 4$, what is the value of x?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

20. The Maxim Telephone Company charges k cents for the first t minutes of a call and charges for any additional time at the rate of r cents per minute. If a certain customer pays \$10, which of the following could be the length of that phone call in minutes?

(A) $\dfrac{1000}{r} + k$

(B) $\dfrac{1000}{r} + tk$

(C) $\dfrac{1000 - k - t}{r}$

(D) $\dfrac{1000 - k}{r} + t$

(E) $\dfrac{1000 + k}{r} + kt$

STOP

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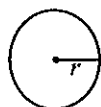**Do not turn to any other section in the test.**

Turn to Section 5 (Page 1) of your answer sheet to answer the questions in this section.

Directions: For this section, solve each problem and decide which is the best of the choices given. Fill in the corresponding circle on the answer sheet. You may use any available space for scratchwork.
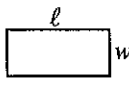
Notes

1. The use of a calculator is permitted.
2. All numbers used are real numbers.
3. Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not drawn to scale. All figure lie in a plane unless other indicated.
4. Unless otherwise specified, the domain of any function f is assumed to be set of all real numbers x for which $f(x)$ is a real number.
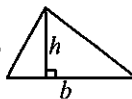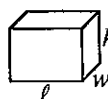
Reference Information

$A = \pi r^2$
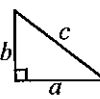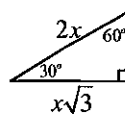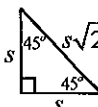$C = 2\pi r$
$A = \ell w$
$A = \frac{1}{2}bh$
$V = \ell wh$
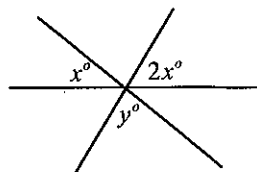$V = \pi r^2 h$
$c^2 = a^2 + b^2$
Special Right Triangles

The numbers of degrees of arc in a circle is $360°$.

The sum of the measures in degrees of the angles is $180°$.

1. If $4(x+y) - 2(x+y) = 12$, then $x+y=$

(A) 2
(B) 4
(C) 6
(D) 8
(E) 10

Note: Figure not drawn to scale

2. In the figure above, three lines intersect at a point. If $y = 2x - 30$, what is the value of x ?
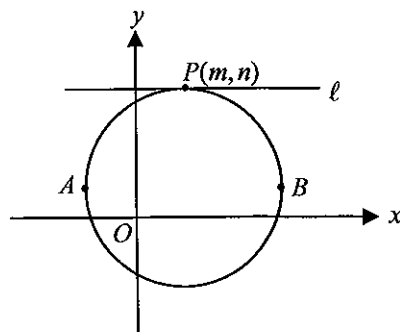
(A) 30
(B) 37
(C) 42
(D) 50
(E) 60

GO ON TO THE NEXT PAGE

3. If Sally drives m miles from her house to her office in f hours, and drives back to her house in g hours, what is her average speed of the entire trip, in miles per hour?

(A) $\dfrac{f+g}{2}$

(B) $\dfrac{m}{f+g}$

(C) $\dfrac{2m}{f+g}$

(D) $\dfrac{fg}{f+g}$

(E) $\dfrac{2fg}{f+g}$

4. If $a+b$ is an odd integer, which of the following must be an even integer?

(A) a
(B) b
(C) ab
(D) $ab+1$
(E) $ab+a$

5. In the xy-coordinate plane, line ℓ is parallel to x-axis, and the points $A(-2,1)$ and $B(4,1)$ lie on a circle. If $\overline{AB}$ (not drawn) is the diameter of the circle, what are the coordinates of point P ?
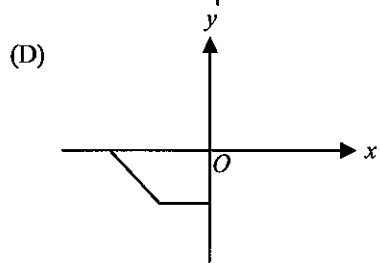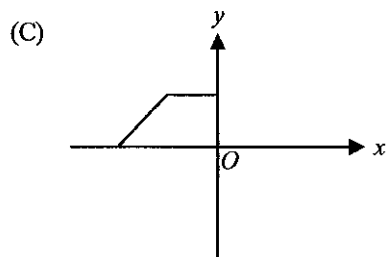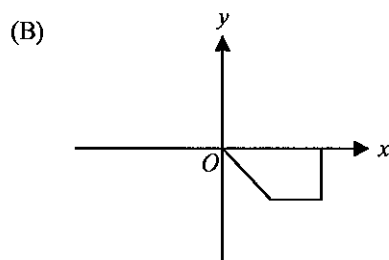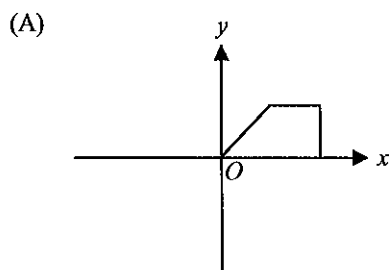
(A) $(2,4)$
(B) $(1,4)$
(C) $(1,3)$
(D) $(1,5)$
(E) $(2,5)$

6. Morgan took five tests last quarter. If the average of the first three tests was p and the average of the rest of the tests was q , what was his average in the quarter?

(A) $p+q$

(B) $\dfrac{p+q}{2}$

(C) $\dfrac{p+q}{5}$

(D) $\dfrac{3p+2q}{2}$

(E) $\dfrac{3p+2q}{5}$

GO ON TO THE NEXT PAGE

(E)
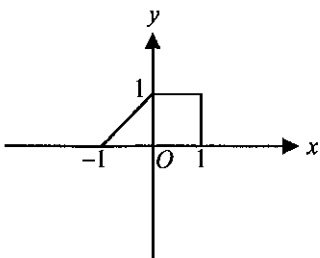
7. The graph of $y = f(x)$ is shown above. Which of the following could be the graph of $y = -f(x+1)$?

(A)

(B)

(C)

(D)
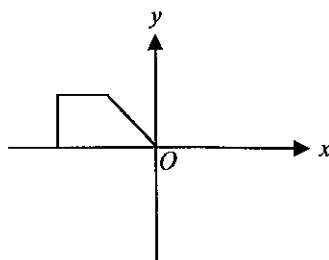
8. For all numbers a and b, let $a \odot b$ be defined as $a \odot b = (a+b)^2 - (a-b)^2$. Which of the following is not the same as the value of $(3 \odot 1) \odot 2$?

(A) $4 \odot 6$

(B) $3 \odot 8$

(C) $2 \odot 12$

(D) $1 \odot 24$

(E) $3 \odot 12$

Directions: For Students-Produced Response questions 9-18, use the grid at the bottom of the answer sheet page on which you have answered questions 1-8.

Each of the remaining 10 questions requires you to solve the problem and enter your answer by making the circles in the special grid, as shown in the examples below. You may use any available space for scratchwork.

Answer: $\dfrac{7}{12}$

Answer: 2.5

Answer: 201
Either position is correct.

Write answer in boxes.

Fraction line

Decimal point

Grid in result.

Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- Mark no more than one circle in any column.

- Because the answer sheet will be machine-scored, **you will receive credit only if the circles are filled in correctly.**

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately.

- Some problems may have more than one correct answer. In such cases, grid only one answer.

- No question has a negative answer.

- **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $\boxed{3\,1\,/\,2}$ is gridded, it will be interpreted as $\dfrac{31}{2}$, not $3\frac{1}{2}$.)

- **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid. For example, if you obtain an answer such as 0.6666..., you should record your result as .666 or .667. **A less accurate value such as .66 or .67 will be scored as incorrect.**

Acceptable ways to grid $\dfrac{2}{3}$ are:

9. Peter can finish a task in 8 hours, and Sam can finish the same task twice as fast as Peter. If they work together, how many hours would it take to complete the task?

10. Since the beginning of 2002, the number of students in Spring Lake high school has doubled every 3-year period. If there were 800 students in the school at the beginning of 2002, how many students are in the school at the beginning of 2008?
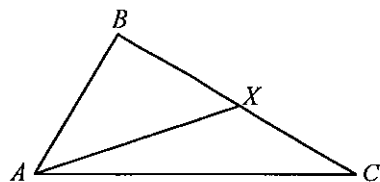
Note: Figure not drawn to scale.

11. In the figure of $\triangle ABC$ above, the area of $\triangle ABX$ is 20 and the area of $\triangle ACX$ is 16.

What is the value of $\dfrac{BX}{CX}$?

$$A = \{0,1,2,3\} \qquad B = \{1,2,3,4\}$$

12. If a is the element from set A, and b is the element from set B, how many distinct possible values of $\dfrac{a}{b}$ are there?

13. Two marbles at a time are to be drawn out from a jar that contains 5 red marbles and 8 black marbles. What is the probability of drawing one red and one black marble from the jar?

14. If $|10-3x| < 5$, what is one possible integer value of x ?

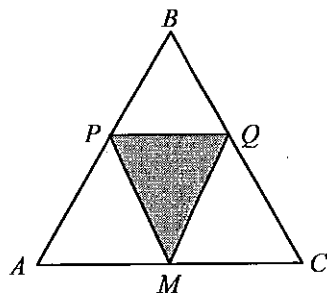**15.** If the square of a positive number is same as the number divided by 4, what is the value of the number?

x	$f(x)$
1	7
3	13
5	19
a	b

Table I

x	$g(x)$
0	12
1	14
2	16
a	b

Table II

17. In the tables above, the points (x, f) and (x, g) represented in the tables lie on straight lines. If the point (a, b) lies on both lines, what is the value of $a + b$?

Note: The figure not drawn to scale.

16. The figure above shows an equilateral triangle ABC. If M is the midpoint of $\overline{AC}$, $\overline{BP}$ is $\dfrac{1}{3}$ of $\overline{AB}$, and $\overline{PQ}$ is parallel to $\overline{AC}$, what fraction of the area of $\triangle ABC$ is shaded?

18. If $x^2 + y^2 \le 25$ and $y \ge 3$, what is the greatest possible value of x ?

S T O P

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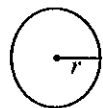**Do not turn to any other section in the test.**

Directions: For this section, solve each problem and decide which is the best of the choices given. Fill in the corresponding circle on the answer sheet. You may use any available space for scratchwork.
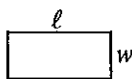
Notes

1. The use of a calculator is permitted.
2. All numbers used are real numbers.
3. Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not drawn to scale. All figure lie in a plane unless other indicated.
4. Unless otherwise specified, the domain of any function f is assumed to be set of all real numbers x for which $f(x)$ is a real number.
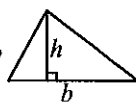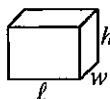
Reference Informatiom

$A = \pi r^2$
$C = 2\pi r$
$A = \ell w$
$A = \dfrac{1}{2}bh$
$V = \ell wh$
$V = \pi r^2 h$
$c^2 = a^2 + b^2$
Special Right Triangles

The numbers of degrees of arc in a circle is $360°$.

The sum of the measures in degrees of the angles is $180°$.

---

1. If $2\sqrt{k}$ is a positive even integer, which of the following MUST be even?

   (A) $\sqrt{k}$
   (B) k
   (C) $\sqrt{2k}$
   (D) $2k$
   (E) $k+1$

$$S = \{3,\ 6,\ 12\}$$

2. From the given above, how many different values can be created by forming fractions $\dfrac{a}{b}$ such that a and b are distinct elements of the set S?

   (A) 2
   (B) 3
   (C) 4
   (D) 5
   (E) 6

GO ON TO THE NEXT PAGE

3. The scatterplot above shows the number of computers sold during 8 years of J.C Computer Inc. Which of the following functions best describe the relationship between n, the number of year, and $P(n)$, the number of computers sold per year (in thousands)?

(A) $P(n) = 60n$

(B) $P(n) = 60 - n$

(C) $P(n) = -2n + 60$

(D) $P(n) = 60 - 4n$

(E) $P(n) = 40$

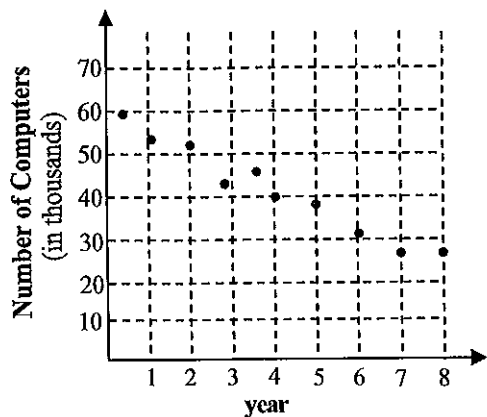**4.** A circle and a triangle have equal areas. If the radius of the circle, represented by t, is equal to the base of the triangle, what is the altitude of the triangle in terms of t?

(A) $\dfrac{t}{2}$

(B) $2\pi t$

(C) $\dfrac{\pi t}{2}$

(D) $\dfrac{\pi t^2}{2}$

(E) $\dfrac{2}{\pi t}$

5. If y is directly proportional to x^2, which of the following could be the graph that shows the relationship between x and y?

(A)

(B)

(C)

(D)

(E)

GO ON TO THE NEXT PAGE
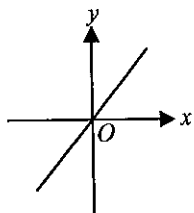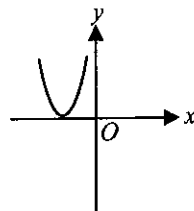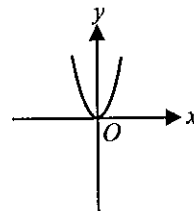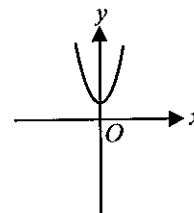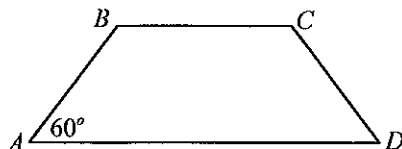
Note: Figure not drawn to scale.

6. In the figure above, $ABCD$ is an isosceles trapezoid. If the length of $\overline{AD}$ is 24 and the length of $\overline{BC}$ is 16, what is the perimeter of the trapezoid?

(A) 40
(B) 56
(C) $40+4\sqrt{2}$
(D) $40+6\sqrt{2}$
(E) $40+8\sqrt{2}$

7. If $\dfrac{a+b}{x-y}=\dfrac{1}{2}$ and $\dfrac{a-b}{x+y}=\dfrac{2}{3}$, then

$$\dfrac{2a^2-2b^2}{3x^2-3y^2}=$$

(A) $\dfrac{1}{3}$

(B) $\dfrac{1}{2}$
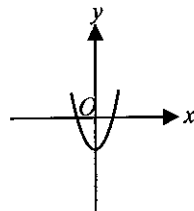
(C) $\dfrac{2}{7}$

(D) $\dfrac{2}{9}$

(E) $\dfrac{2}{3}$

8. Jimmy drove a car at a constant rate of speed to a shopping mall, spent a while in the mall, and returned home at a constant rate of speed. Which of the following graphs could correctly represent the distance from his house over time?

(A)

(B)

(C)

(D)

(E)

GO ON TO THE NEXT PAGE
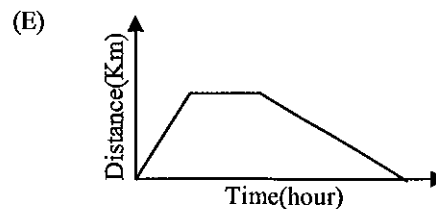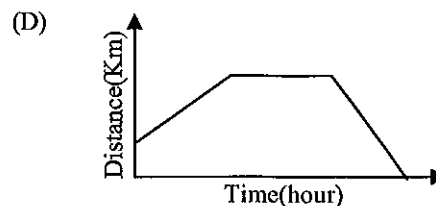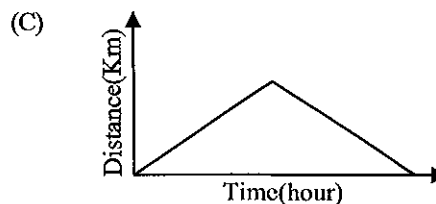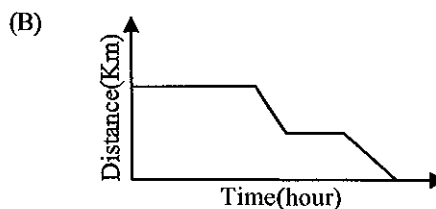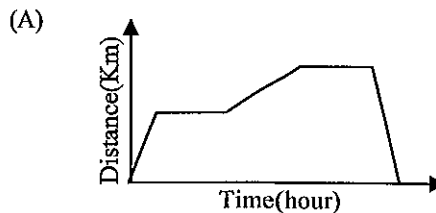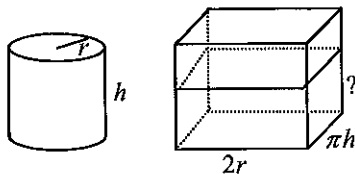
Note: Figure not drawn to scale.

9. In the figures above, the interior dimensions of a cylindrical tank full of water have radius r and height h. All of the water in the tank is poured into a second tank. If the interior dimensions of the second tank are $2r$ feet long and πh feet wide, what is the height of the water in the second tank ?

(A) $\dfrac{1}{2}$

(B) $\dfrac{\pi}{h}$

(C) $\dfrac{r}{2}$

(D) $\dfrac{\pi}{2}$

(E) $\dfrac{\pi r}{2}$

10. If $2^{21} = x + 2^{20}$, what is the value of x ?

(A) 2
(B) 2^2
(C) 3^2
(D) 2^{20}
(E) 2^{21}

NUMBER OF EMPLOYEES

	Men	Women
Salary over $50,000	10	5
Salary $50,000 or less	40	35

11. The table above shows the number of employees at J.K Computer Technology. If one employee will be picked at random, what is the probability of picking a woman whose salary is over $50,000?

(A) $\dfrac{1}{18}$

(B) $\dfrac{1}{8}$

(C) $\dfrac{1}{5}$

(D) $\dfrac{1}{4}$

(E) $\dfrac{3}{18}$

12. If $5^3 + 5^3 + 5^3 + 5^3 + 5^3 = 5^n$, where n is a positive integer, what is the value of n ?

(A) 3
(B) 4
(C) 5
(D) 6
(E) 7

GO ON TO THE NEXT PAGE
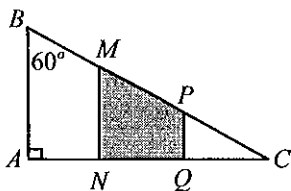
Note: Figure not drawn to scale.

13. In the figure above, $\overline{AB} \parallel \overline{MN} \parallel \overline{PQ}$, $\overline{AN} = \overline{NQ} = \overline{QC}$, and $\overline{AB} = 6$. What is the area of the shaded region?

(A) 8
(B) 10
(C) $6\sqrt{3}$
(D) $12\sqrt{3}$
(E) $18\sqrt{3}$

14. If $\dfrac{1}{p} + \dfrac{1}{q} = t$, and $pq = w$, then $p + q =$

(A) $\dfrac{w}{t}$

(B) $\dfrac{t}{w}$

(C) tw

(D) $\dfrac{tw}{2}$

(E) $t(t + w)$

15. For all numbers a and b , let $a \triangle b$ be defined as $a \triangle b = a^2 - b$. What is the value of $\left(2^{4\triangle13}\right) \triangle \left(3^{5\triangle23}\right)$?

(A) -17
(B) 17
(C) -55
(D) 55
(E) 70
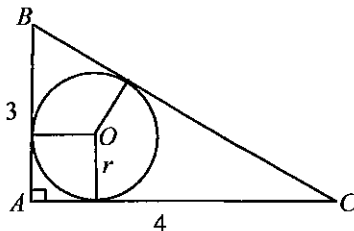
16. In the figure above, a circle O is inscribed in $\triangle ABC$. If $AB = 3$, $AC = 4$, and the radius of the circle is r , what is the value of r ?

(A) 1

(B) $\sqrt{2}$

(C) $\sqrt{3}$

(D) $\dfrac{\sqrt{2}}{3}$

(E) $\sqrt{3} - 1$

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.

TEST 2 — ANSWER KEY

#	SECTION 3	SECTION 5	SECTION 7
1	D	C	D
2	C	C	C
3	C	C	D
4	A	C	B
5	E	B	D
6	B	E	B
7	D	D	D
8	C	E	E
9	C	$\frac{8}{3}$, 2.66 or 2.67	C
10	B	3200	D
11	A	$5/4$ or 1.25	A
12	B	10	B
13	E	.512 or .513	C
14	D	2, 3, or 4	C
15	A	$1/4$ or 0.25	D
16	A	$2/9$ or .222	A
17	A	36	
18	C	4	
19	A		
20	D		

TEST 2   SECTION 3

1. (D)
$3(a+2b-c)=12 \Rightarrow a+2b-c=4$. Thus,
$a+2b=4+c$.

2. (C)
The pairs of (X,Y) are

$(1,7)$ $(2,6)$ $(3,5)$ $(4,4)$ $(5,3)$ $(6,2)$ $(7,1)$
$\Rightarrow$ 7 numbers

3. (C)
The clever integers between 20 and 100 are
27, 36, 45, 54, 63, 72, 81, 90. The numbers
divisible by 27 are 27, 54, 81. Thus, the
fraction is $\frac{3}{8}$.

4. (A)

$8^n \times 4^2 = 2^{10} \Rightarrow 2^{3n} \times 2^4 = 2^{3n+4} = 2^{10}$. It
follows that $3n+4=10$. Therefore, $n=2$.

5. (E)
Since $\frac{p}{q} \geq 1 \Rightarrow p \geq q$. The pairs of
(p,q) will be as follows.
$(1,1)$ $(2,1)$ $(2,2)$ $(3,1)$ $(3,2)$ $(3,3)$ $(4,1)$
$(4,2)$ $(4,3)$ $(4,4)$
All possible outcomes are
$4 \times 4 = 16$. Therefore, $P = \frac{10}{16} = \frac{5}{8}$.

6. (B)
$n = 4p^2q \Rightarrow n = 2^2 p^2 q$.
From prime factorization, the number of
factors can be obtained by multiplying the
exponents added by 1.
The number of factors
$= (2+1)(2+1)(1+1) = 18$

Or, use $p = 3$ and $q = 5$. Then $n = 180$.
The factors of 180
$\rightarrow$ 1,2,3,4,5,6,9,10,12,15,18,20,30,45,60,90, 180. (18 factors)

---

7. (D)
The sum of exterior angles is always $360°$.
Or, $(180 - a) + (180 - b) + (180 - c) = 180$.
Therefore, $a + b + c = 360$.

---

8. (C)
Translate to the right by 2 and down by 1.
Therefore, $g(x) = f(x - 2) + 1$.
It follows that
$g(x) = (x - 2)^2 - 1$.

---

9. (C)
$\dfrac{C}{G} = \dfrac{1}{2}$ and $\dfrac{G}{P} = \dfrac{4}{5}$. Therefore,
$\dfrac{C}{P} = \dfrac{C}{G} \times \dfrac{G}{P} = \dfrac{1}{2} \times \dfrac{4}{5} = \dfrac{2}{5}$

---

10. (B)
Since $K = \dfrac{A}{r^2}$,
$\dfrac{20}{4^2} = \dfrac{45}{r^2} \Rightarrow r^2 = 36$. Therefore, $r = 6$.

---

11. (A)
$\angle PQW = \dfrac{720}{6} = 120$ and
$\angle RQW = \dfrac{540}{5} = 108$.
Therefore, $\angle PQR = 120 - 108 = 12$

---

12. (B)
Cathy's rate per hour $= \dfrac{1}{8}$ and Danny's rate
per hour $= \dfrac{1}{6}$. The sum of the rates is
$\dfrac{1}{8} + \dfrac{1}{6} = \dfrac{7}{24}$.
If they work 3 hours, $\dfrac{7}{24}(3) = \dfrac{7}{8}$ of the job
will be done. $\dfrac{1}{8}$ of the job is left to be
finished.

---

13. (E)
The slope is negative and y-intercept is
positive. Thus, $-\dfrac{a}{b} < 0$ and
$-\dfrac{c}{b} > 0 \Rightarrow \dfrac{a}{b} > 0$ and $\dfrac{c}{b} < 0$.

---

14. (D)
It is multiple of 35 from 100 to 999. Thus
$\left\lfloor \dfrac{999}{35} \right\rfloor - \left\lfloor \dfrac{99}{35} \right\rfloor = 28 - 2 = 26$.

---

15. (A)
$\left(\dfrac{p}{100} \times q \right) \div \left(\dfrac{q}{100} \times p \right) = 1$

---

16. (A)
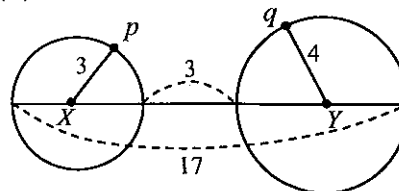
In the figure above, $3 \le \overline{pq} \le 17$.

---

17. (A)
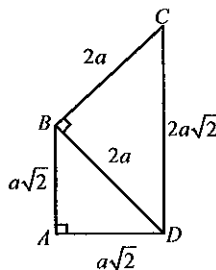
In the figure, the perimeter is $2a + 4a\sqrt{2}$.

---

18. (C)
Approximately $x = -2.25$.
$\left| \dfrac{x}{5} \right| = \left| \dfrac{-2.25}{5} \right| = 0.45$.
Therefore, point C best represents the
coordinate.

---

19. (A)
In the xy-plane,
Since $f(k) = 4 \Rightarrow k = g(x) = 4 \Rightarrow x = 1$.

20. (D)

k cents $\to$ upto t minutes

For the $(1,000-k)$ cents $\to r$ cents per minute

It follows that the minutes is $\dfrac{1000-k}{r}$.

Therefore, total length of the phone call is $\dfrac{1000-k}{r}+t$.

TEST 2   SECTION 5

---

1. (C)

$4(x+y)-2(x+y)=2(x+y)=2 \Rightarrow x+y=1$.

---

2. (C)

In the figure above,

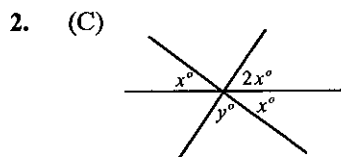$3x+y=180 \Rightarrow 3x+(2x-30)=180$.

It follows that

$5x=210 \Rightarrow x=42$.

---

3. (C)

Average speed$=\dfrac{\text{Entire distance}}{\text{Entire time}}=\dfrac{2m}{f+g}$.

---

4. (C)

$a+b=odd$. you can use $a=2$ and $b=1$,or $a=1$ and $b=2$.

(C) is always true.

---

5. (B)

The midpoint of A and

$B=\left(\dfrac{-2+4}{2},\dfrac{1+1}{2}\right)=(1,1)$.

Since the radius of the circle is 3, the coordinates of point P is $(1,4)$.

---

6. (E)

The sum of the first three tests is $3p$ and the sum of last two tests is $2q$.

The entire average $=\dfrac{3p+2q}{5}$.

---

7. (D)

Translate to the left by 1 and reflection over the x-axis.

---

8. (E)

$3\odot1=(3+1)^2-(3-1)^2=12$ and

$(3\odot1)\odot2=12\odot2=14^2-10^2=96$.

Or

$a\odot b=(a+b)^2-(a-b)^2=4ab$

$3\odot1=4(3)(1)=12$ and

$12\odot2=4(12)(2)=96$.

$3\odot12=4(3)(12)=144\neq96$.

---

9. $\frac{8}{3}$ or 2.66, 2.67

	Hours	Rate	Combined Rate
Peter	8	$\frac{1}{8}$	$\frac{3}{8}$
Sam	4	$\frac{1}{4}$	

In the figure above, $1\div\dfrac{3}{8}=\dfrac{8}{3}$ hours.

---

10. 3200

$800\to1600\to3200$, increased every 3 years.

---

11. $\frac{5}{4}$ or 1.25

With the same height, The ratio of the areas is equal to the ratio of the lengths. $\dfrac{20}{16}=\dfrac{5}{4}$

---

12. 10

$\dfrac{a}{b}\Rightarrow\dfrac{0}{1,2,3,4}=0$, $\dfrac{1}{1},\dfrac{1}{2},\dfrac{1}{3},\dfrac{1}{4}$,

$\dfrac{2}{1},\dfrac{2}{2},\dfrac{2}{3},\dfrac{2}{4},\dfrac{3}{1},\dfrac{3}{2},\dfrac{3}{3},\dfrac{3}{4}$.

Therefore, there are 10 distinct values.

---

13. .512 or .513

There are two possible cases.

(R,B) or (B,R) .

For $(R,B) \Rightarrow \dfrac{5}{13} \times \dfrac{8}{12} = \dfrac{10}{39}$ and

for $(B,R) \Rightarrow \dfrac{8}{13} \times \dfrac{5}{12} = \dfrac{10}{39}$. Therefore,

$\dfrac{10}{39} + \dfrac{10}{39} = \dfrac{20}{39} \Rightarrow .512$ or $.513$.

14. 2, 3, or 4

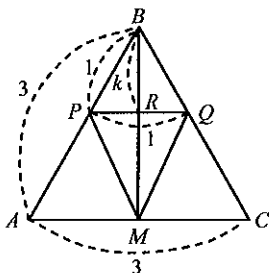$|10-3x| < 5 \Rightarrow |3x-10| < 5$. It follows that

$-5 < 3x-10 < 5 \Rightarrow 5 < 3x < 15 \Rightarrow \dfrac{5}{3} < x < 5$.

Therefore, there are three integers, 2, 3, and 4.

15. $\dfrac{1}{4}$ or 0.25

$n^2 = \dfrac{n}{4} \Rightarrow n = \dfrac{1}{4}$

16. $\dfrac{2}{9}$ or .222

In the figure above, $\triangle BPQ$ and $\triangle BAC$ are

similar. $\dfrac{BR}{BM} = \dfrac{BP}{AB} = \dfrac{1}{3}$.

If $BP = k$, then $BM = 3k$.

Therefore, $RM = 2k$. The area of

$\triangle ABC = \dfrac{1}{2}(3 \times 3k) = 4.5k$ and the area of

$\triangle PQM = \dfrac{1}{2}(1 \times 2k) = k$.

Therefore, $\dfrac{\triangle PQM}{\triangle ABC} = \dfrac{k}{4.5k} = \dfrac{2}{9}$.

17. 36

Point (a,b) lies on both of the two lines.

The slope of f is $\dfrac{13-7}{3-1} = 3 = \dfrac{b-7}{a-1}$. Thus,

$b = 3a+4$ --(1).

The slope of g is $\dfrac{14-12}{1-0} = 2 = \dfrac{b-12}{a-0}$.

Thus $b = 2a+12$ --(2). From (1) and (2),

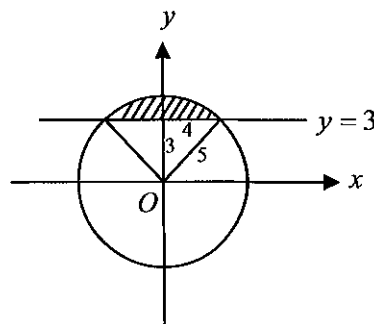$a = 8$ and $b = 28$. Therefore, $a+b = 36$.

18. 4

If the value of y is the minimum, the value of

x will be the maximum. The minimum of

y is 3, then

$x^2 + 9 \le 25 \Rightarrow x^2 \le 16 \Rightarrow -4 \le x \le 4$.

Therefore, the greatest possible value of x is

4. Or, you can solve it geometrically as

follows.

In the figure above, the greatest possible

value of x in the shaded region is 4.

TEST 2   SECTION 7

1. (D)

$2\sqrt{k} = $ even $\Rightarrow \sqrt{k}$ is even. $\Rightarrow k$ is even.

or $\sqrt{k}$ is odd. $\Rightarrow k$ id odd.

Therefore, $2k$ is always even.

Or, use numbers. Let k be 4 or 9.

Only (D) is always even.

2. (C)

$\dfrac{a}{b} \Rightarrow \dfrac{3}{6}, \dfrac{3}{12}, \dfrac{6}{3}, \dfrac{\cancel{6}}{\cancel{12}}, \dfrac{12}{3}, \dfrac{\cancel{12}}{\cancel{6}}$.

Therefore, four different values are there.

3. (D)

Approximately, the y-intercept is 60, and the

slope is $\dfrac{28-60}{8} \cong -4$. Therefore,
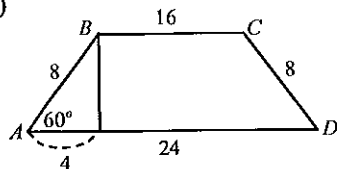
$y = -4x+60$.

4. (B)

The areas are equal. $\pi t^2 = \dfrac{t \times h}{2} \Rightarrow h = 2\pi t.$

---

5. (D)

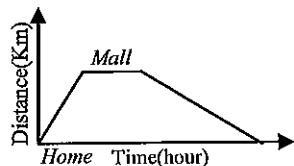$y = kx^2$ is direct variation. The function passes through the origin.

---

6. (B)

In the figure, Perimeter is 56.

---

7. (D)

$\left(\dfrac{a+b}{x-y}\right)\left(\dfrac{a-b}{x+y}\right) = \dfrac{a^2-b^2}{x^2-y^2} = \left(\dfrac{1}{2}\right)\left(\dfrac{2}{3}\right) = \dfrac{1}{3}.$

$\dfrac{2a^2-2b^2}{3x^2-3y^2} = \dfrac{2(a^2-b^2)}{3(x^2-y^2)} = \dfrac{2}{3}\left(\dfrac{1}{3}\right) = \dfrac{2}{9}.$

---

8. (E)

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9. (C)

The volume of the water is equal. Thus,

$\pi r^2 h = 2r \cdot \pi h \cdot H \Rightarrow H = \dfrac{\pi r^2 h}{2\pi r h} = \dfrac{r}{2}.$

---

10. (D)

$2^{21} = 2 \cdot 2^{20} = 2^{20} + 2^{20} = x + 2^{20} \Rightarrow x = 2^{20}.$
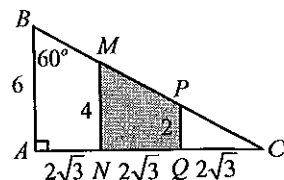
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11. (A)

There are 5 women out of 90 employees.

$P = \dfrac{5}{90} = \dfrac{1}{18}$

---

12. (B)

$5^3 + 5^3 + 5^3 + 5^3 + 5^3 = 5 \cdot 5^3 = 5^4.$ Therefore, $x = 4.$

---

13. (C)

In the figure above,

$\triangle CPQ \sim \triangle CMN \sim \triangle CBA$. It follows that the ratio of the length is 1:2:3. $AC = 6\sqrt{3}$. Thus,

the area of $\triangle CMN = \dfrac{1}{2}\left(4\sqrt{3} \times 4\right) = 8\sqrt{3}$ and

the area of $\triangle CPQ = \dfrac{1}{2}\left(2\sqrt{3} \times 2\right) = 2\sqrt{3}$.

Therefore, $8\sqrt{3} - 2\sqrt{3} = 6\sqrt{3}$.

Or, you can use the ratio of the areas.

$1:4:9 = k, 4k, 9k$

the area of shaded region $= 3k$.

The area of $\triangle ABC$ is

$\dfrac{1}{2}\left(6 \times 6\sqrt{3}\right) = 18\sqrt{3} = 9k$. Thus $k = 2\sqrt{3}$.

Therefore, $3k = 6\sqrt{3}$.

---

14. (C)

$\dfrac{1}{p} + \dfrac{1}{q} = \dfrac{p+q}{pq} = t \Rightarrow \dfrac{p+q}{w} = t$. Therefore,
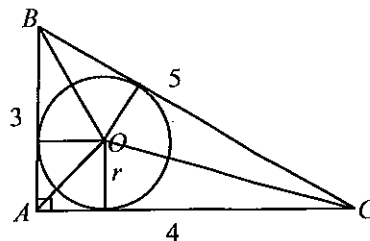
$p + q = tw.$

---

15. (D)

$4 \triangle 13 = 4^2 - 13 = 3$ and $5 \triangle 23 = 5^2 - 23 = 2$.

Therefore,

$2^3 \triangle 3^2 = 8 \triangle 9 = 8^2 - 9 = 64 - 9 = 55$.
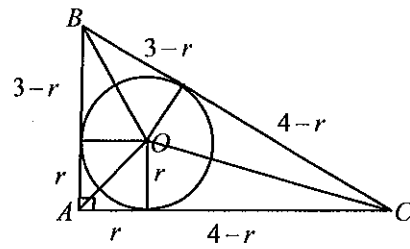
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16. (A)

The area of $\triangle ABC$ is $\dfrac{3 \cdot 4}{2} = 6$. The area of

$\triangle ABC$ in terms of $r = \dfrac{1}{2}\left(5r + 4r + 3r\right) = 6r$.

Therefore, $6r = 6 \Rightarrow r = 1.$

Or,

Because the lengths of tangent to a circle is equal,

$BC = (3-r)+(4-r) = 5$.

Therefore, $r = 1$.

$\boxed{END}$

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