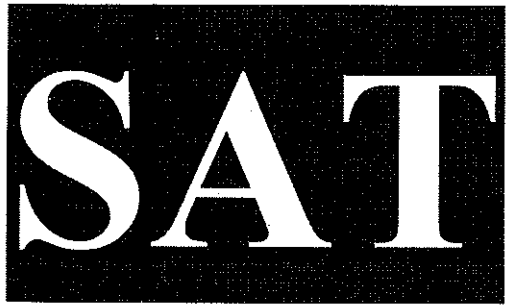
Dr. John Chung's SAT Math



TEST 1

ANSWER SHEET

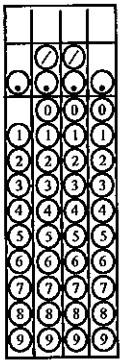
TEST #:

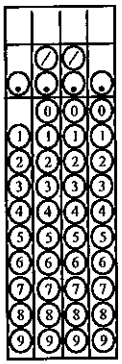
SECTION 3

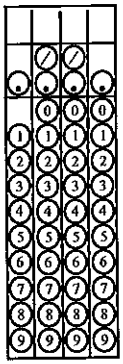
1	A B C D E	11	A B C D E	21	A B C D E	31	A B C D E
2	A B C D E	12	A B C D E	22	A B C D E	32	A B C D E
3	A B C D E	13	A B C D E	23	A B C D E	33	A B C D E
4	A B C D E	14	A B C D E	24	A B C D E	34	A B C D E
5	A B C D E	15	A B C D E	25	A B C D E	35	A B C D E
6	A B C D E	16	A B C D E	26	A B C D E	36	A B C 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

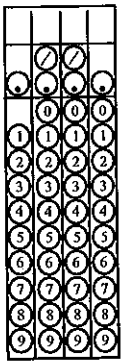
SECTION 5

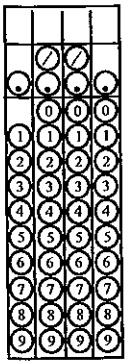
1	A B C D E	11	A B C D E	21	A B C D E	31	A B C D E
2	A B C D E	12	A B C D E	22	A B C D E	32	A B C D E
3	A B C D E	13	A B C D E	23	A B C D E	33	A B C D E
4	A B C D E	14	A B C D E	24	A B C D E	34	A B C D E
5	A B C D E	15	A B C D E	25	A B C D E	35	A B C D E
6	A B C D E	16	A B C D E	26	A B C D E	36	A B C 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

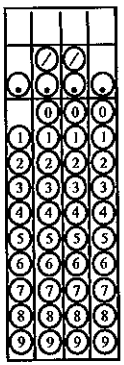
9 

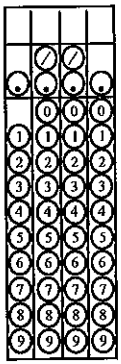
10 

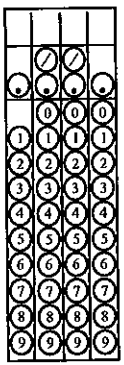
11 

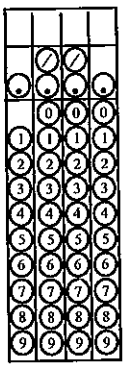
12 

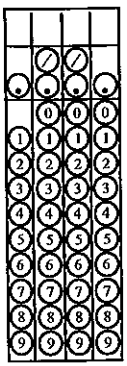
13 

14 

15 

16 

17 

18 

SECTION 7

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

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 — _____ *numer of correct* — _____ *number of incorrect* +4 = _____

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		

SECTION 3
Time- 25 minutes
20 Questions

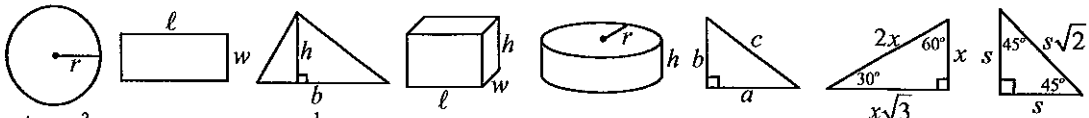
Turn to Section 3 (Page 1) of your answer sheet to answer the questions in this section.

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



$A=\pi r^2$ $C=2\pi r$ $A=\ell w$ $A=\frac{1}{2}bh$ $V=\ell wh$ $V=\pi r^2 h$ $c^2=a^2+b^2$ 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 $x-2y=10$, $y=z+1$, and $z=2$, what is the value of x?

(A) 10
(B) 12
(C) 14
(D) 16
(E) 18

4, 8, 12, 16,

2. The first term in the sequence is 4, and each term after the first is determined by adding 4. What is the value of 20th term?

(A) 20
(B) 40
(C) 60
(D) 80
(E) 100

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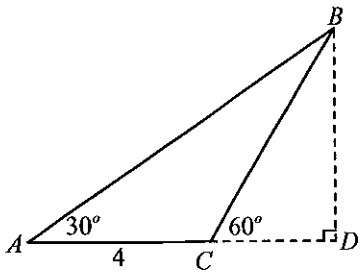
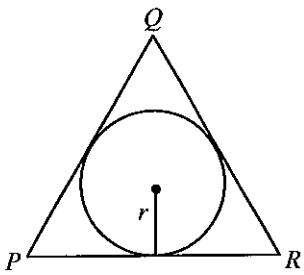


Note: Figure not drawn to scale.

3. In the figure above, $\angle BAC = 30^\circ$, $\angle BCD = 60^\circ$, and the length of $\overline{AC}$ is 4. What is the area of $\triangle ABC$?

(A) 4
(B) $4\sqrt{3}$
(C) 8
(D) $8\sqrt{3}$
(E) 16



4. In the figure above, a circle is tangent to the side of equilateral triangle PQR and the radius r equals 5. What is the perimeter of $\triangle PQR$?

(A) 20
(B) 30
(C) $30\sqrt{3}$
(D) 35
(E) $40\sqrt{2}$

5. A bag contains 3 red marbles and 6 black marbles. What is the probability that you select two red marbles if you reach in the bag and randomly grab two marbles without replacement?

(A) $\frac{2}{9}$
(B) $\frac{2}{81}$
(C) $\frac{1}{36}$
(D) $\frac{1}{18}$
(E) $\frac{1}{12}$

6. Kimberly earns k dollars per week. At this rate how many weeks will it take her to earn p dollars?

(A) $10p$
(B) kp
(C) $\frac{k}{p}$
(D) $\frac{100k}{p}$
(E) $\frac{p}{k}$

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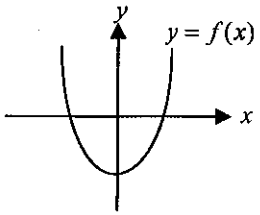
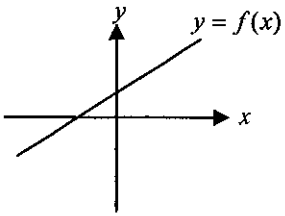
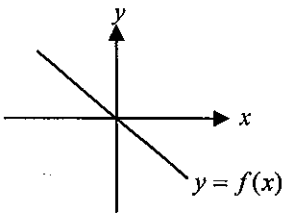
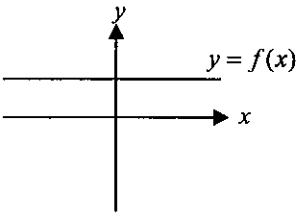
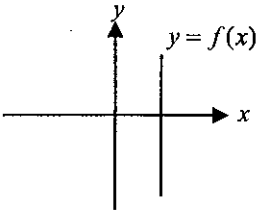
7. Which of the following graphs shows a relationship in which y is directly proportional to x?

(A)


(B)


(C)


(D)


(E)


8. If $rs^2t^3u^3 > 0$ and $u < 0$, which of the following must be true?

(A) $rt < 0$
(B) $urt < 0$
(C) $r > 0$
(D) $t > 0$
(E) $st > 0$

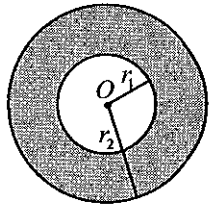
9. To arrive on time, a ship needs 5 hours to complete a voyage. If the ship must arrive in 4 hours, by what percent must the speed of the ship be increased?

(A) 15%
(B) 20%
(C) 25%
(D) 27%
(E) 30%

GO ON TO THE NEXT PAGE

10. If $(p-3)\times\frac{p}{(p+5)(p-3)}=0$, What is the value of p?

(A) 0
(B) 3
(C) 0 and 3
(D) 0 and -5
(E) No solution



12. In the figure above, r_1 and r_2 is the radius of the circles which have the same center. If the area of the shaded region is 12 and the ratio of r_1 to r_2 is 1:2, what is the area of the smaller circle?

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

11. A certain job can be done in 20 hours by 4 people. How many people are needed to do the same job in 10 hours?

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

x	$f(x)$
a	b
2	7
3	9

13. The table above shows some values for the function f. If f is a linear function, what is the value of b in terms of a?

(A) $b=\frac{7}{2}a$
(B) $b=3a$
(C) $b=a+5$
(D) $b=a+6$
(E) $b=2a+3$

GO ON TO THE NEXT PAGE

14. In the $xy-$plane, the equation of line ℓ is $x+3y=5$. If line m is perpendicular with line ℓ, what is a possible equation of line m?

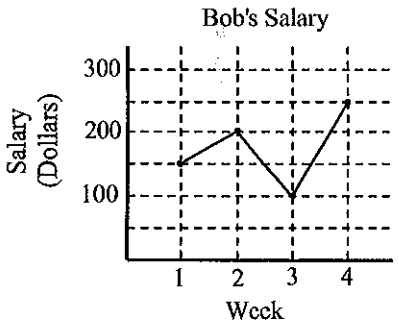
(A) $y=-\frac{1}{3}x+2$

(B) $y=\frac{1}{3}x-1$

(C) $y=\frac{3}{2}x-3$

(D) $y=-3x+1$

(E) $y=3x+\frac{5}{2}$



15. The graph above shows Bob's weekly salary in dollars for the first four weeks working at a public library. Bob's salary at week 4 is what percent greater than his salary at week 1?

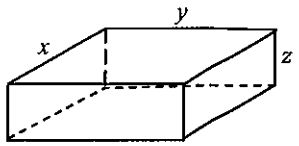
(A) $33\frac{1}{3}\%$

(B) 40%

(C) 50%

(D) $66\frac{2}{3}\%$

(E) 100%



16. The figure above shows a rectangular solid with width x, length y, and height z. If $xy=20$, $yz=10$, and $zx=18$, what is the volume of the rectangular solid?

(A) 60
(B) 70
(C) 80
(D) 90
(E) 100

17. If exactly two of the three integers a, b, and c are odd, which of the following must be odd?

I. $a+bc$

II. $\frac{ab}{c}$

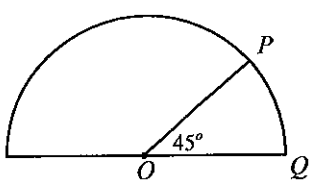
III. $a(b+c)$

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

GO ON TO THE NEXT PAGE

18. There are two different means, the arithmetic, $A = \frac{a+b}{2}$ and the harmonic, $H = \frac{2ab}{a+b}$. If the arithmetic mean is equal to the harmonic mean, which of the following must be true?

(A) $a = 0$ and $b = 0$
(B) $ab = 0$
(C) $a = 1$ and $b = 1$
(D) $a = b$
(E) $a + b = 0$



19. In the figure above, PQ is the arc of a circle with center O. If the length of arc PQ is 4, what is the area of sector OPQ?

(A) 54π
(B) $\frac{48}{\pi}$
(C) 32π
(D) $\frac{32}{\pi}$
(E) 16π

20. In a certain class, $\frac{4}{7}$ of the students are boys, and the ratio of the students older than or equal to 10 years to the students less than 10 years old is 2:3. If $\frac{2}{3}$ of the girls are less than 10 years old, what fraction of the boys are older than or equal to10 years?

(A) $\frac{9}{20}$
(B) $\frac{11}{20}$
(C) $\frac{2}{3}$
(D) $\frac{14}{15}$
(E) $\frac{9}{35}$

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.

SECTION 5
Time- 25 minutes
18 Questions

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.
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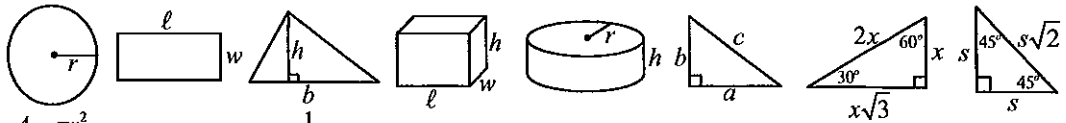


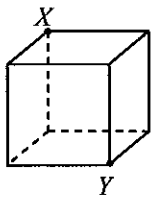
$A = \pi r^2$, $C = 2\pi r$ $\quad A = \ell w$ $\quad A = \frac{1}{2}bh$ $\quad V = \ell wh$ $\quad V = \pi r^2 h$ $\quad c^2 = a^2 + b^2$ $\quad$ Special Right Triangles

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 $|k-5| \le 8$, which of the following CANNOT be the value of k?

(A) 10
(B) 8
(C) 5
(D) –3
(E) –4



2. In the figure above, $\overline{XY}$ is the diagonal of the cube (not drawn in the figure). How many different diagonals of the same length as $\overline{XY}$ are there?

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

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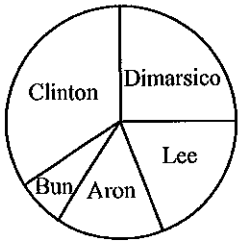
Votes For Favorite Professor



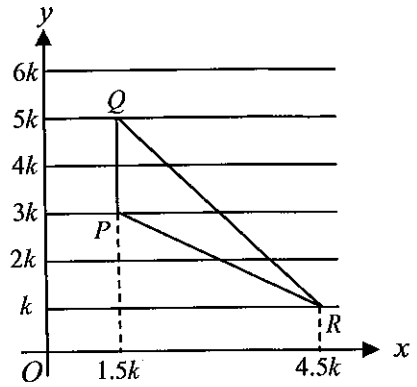
3. The circle graph above shows the results of a vote for favorite professors in JFK University. If 800 votes were cast, how many possible numbers of votes did Professor Lee receive?

(A) 150
(B) 200
(C) 250
(D) 400
(E) 500

4. In the fraction $\frac{a}{2b}$, a is 5 less than two times b.

If the fraction is equal to $\frac{1}{2}$, what is the denominator of this fraction?

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



5. In the figure above, k is a positive number. If the area of $\triangle PQR$ is 12, what is the value of k?

(A) 1
(B) 2
(C) $2\sqrt{2}$
(D) 4
(E) $4\sqrt{2}$

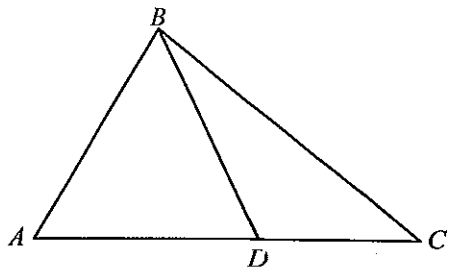
6. If x, y, and z are positive and $\frac{x^2y^{-3}}{z^2} = 9y$, which of the following is equal to x^{-1}?

(A) $\frac{1}{3y^2z}$
(B) $\frac{3z}{2}$
(C) $\frac{1}{3z}$
(D) $\frac{yz}{3}$
(E) $\frac{9y}{z^2}$

GO ON TO THE NEXT PAGE

7. Allen and Barbra leave their house at the same time. Allen walks due east for 3 hours and due north for $3\frac{1}{2}$ hours at the average rate of 2 kilometers per hour, and Barbra walks due south for 3 hours and due west for 2 hours at the average of 3 kilometers per hour. At the end of their walk, what is the straight-line distance between them, in kilometers?

(A) 25
(B) 20
(C) $8\sqrt{2}$
(D) 8
(E) $6\sqrt{2}$



Note: Figure not drawn to scale.

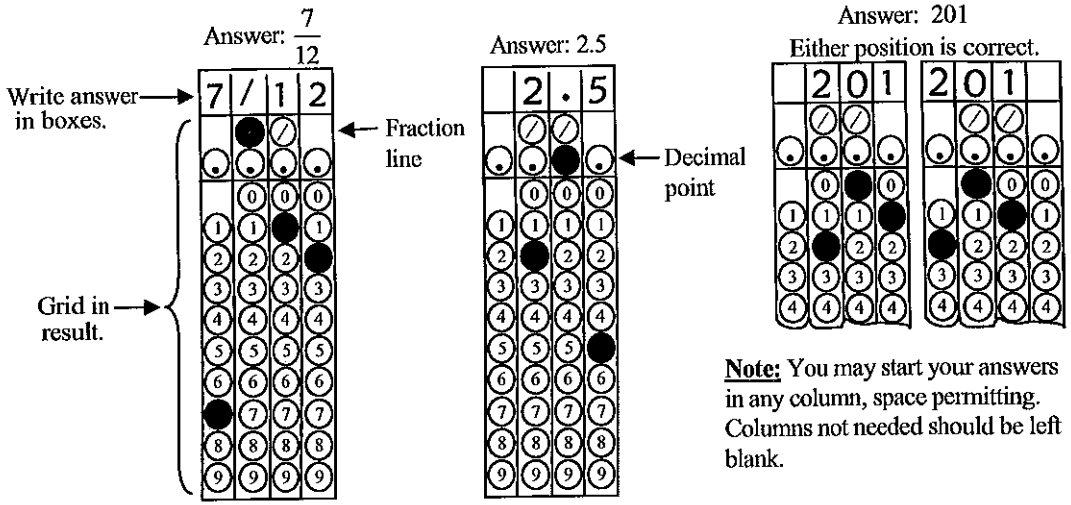
8. In the figure above, the area of $\triangle ABD$ is 16 and the area of $\triangle BCD$ is 9. What is the ratio of the length of AD to the length of DC?

(A) 2:1
(B) 3:1
(C) 4:3
(D) 16:9
(E) 256:81

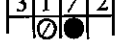
GO ON TO THE NEXT PAGE

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.

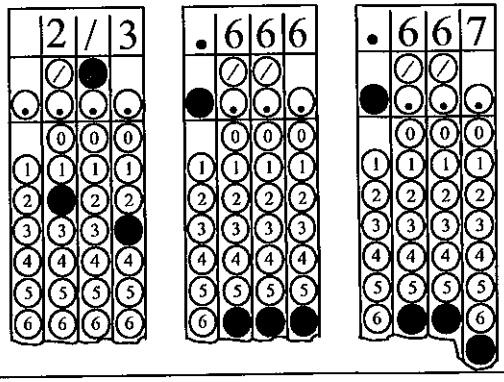


Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- 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  is gridded, it will be interpreted as $\frac{31}{2}$, 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 $\frac{2}{3}$ are:



9. Peter goes on a 30-mile bike ride every Sunday. He rides the distance in 3 hours. At this rate, how many miles can he ride in 5 hours and 30 minutes?

$f(k) = |6 - k^2|$, k = positive integer

10. If $f(k) = 3$, what is the value of k that satisfies the equation above?

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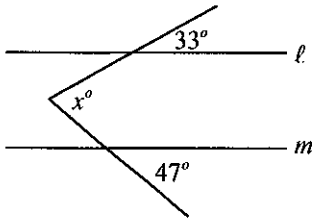
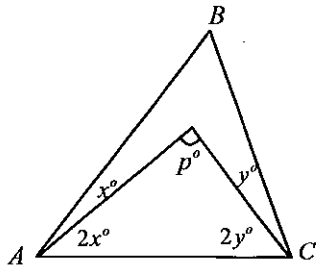


Note: Figure not drawn to scale.

11. In the figure above, line ℓ is parallel to line m. What is the value of x?

12. The average of a set of 8 consecutive odd integers is 18. What is the greatest of these 8 integers?

13. Let the function f be defined by $f(x) = x - p$. If $f(2) = -1$, what is the value of $f(2p)$?



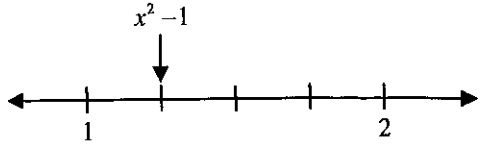
Note: Figure not drawn to scale.

14. If $\angle ABC = 30^\circ$ in $\triangle ABC$, what is the value of p?

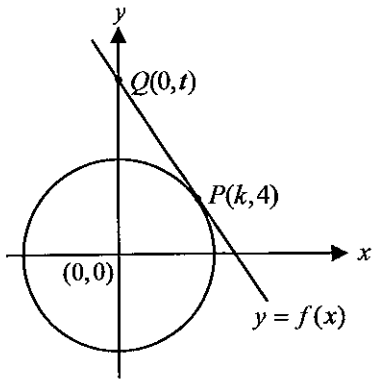
GO ON TO THE NEXT PAGE

15. 20 grams of solution A has 10% of alcohol by mass and 15 grams of solution B has 20% of alcohol by mass. If 10 grams of the solution A is added to 10 grams of the solution B, what is the percent of alcohol in the mixture?

16. If average of $2a$ and b is equal to 50 percent of $4b$, what is the value of $\frac{a}{b}$?



17. On the number line above, there are 4 equal intervals between 1 and 2. What is the positive value of x?



18. In the figure above, a circle is tangent to the line at point P. If the radius of the circle is 5, what is the value of t, the y-intercept of the line?

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.

SECTION 7
Time- 20 minutes
16 Questions

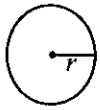
Turn to Section 7 (Page 2) of your answer sheet to answer the questions in this section.

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.

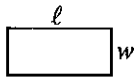
Notes

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.

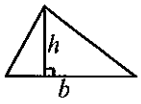
Reference Information



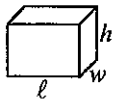
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

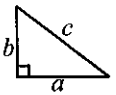


$A = \frac{1}{2}bh$

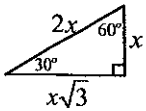


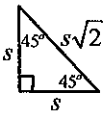
$V = \ell wh$

$V = \pi r^2 h$



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





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 X is the set of all integers greater than π, and Y is the set of all integers less than π^2, how many integers are in both sets?

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

2. If $\sqrt{k+2} = k$, what is the value of k?

(A) -1
(B) 2
(C) -1 or 0
(D) -1 or 2
(E) -2 or 2

GO ON TO THE NEXT PAGE

3. Out of 50 families in a certain town, 20 own a dog and 35 own a cat. If 2 families don't own either of them, what fraction of the families owns both a dog and a cat?

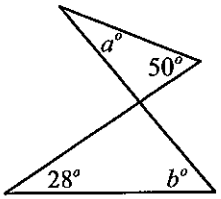
(A) $\frac{7}{50}$

(B) $\frac{1}{5}$

(C) $\frac{11}{50}$

(D) $\frac{6}{25}$

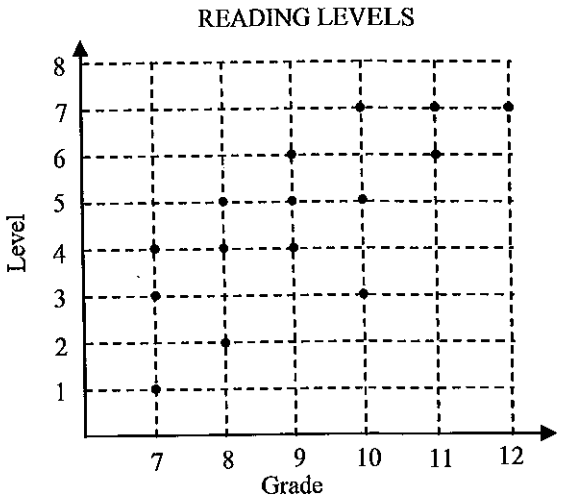
(E) $\frac{7}{48}$



Note: Figure not drawn to scale.

4. In the figure above, what is the value of $|a-b|$?

(A) 10
(B) 17
(C) 20
(D) 22
(E) 25



5. The scatterplot above shows the reading levels by grade for 15 students in a certain book-reading club. What is the median reading level for the 15 students?

(A) 3
(B) 5
(C) 5.5
(D) 6
(E) 6.5

6. a and b are different positive integers and a is greater than b. If $a^2 - b^2 = 7$, what is the value of ab?

(A) 6
(B) 8
(C) 10
(D) 12
(E) 14

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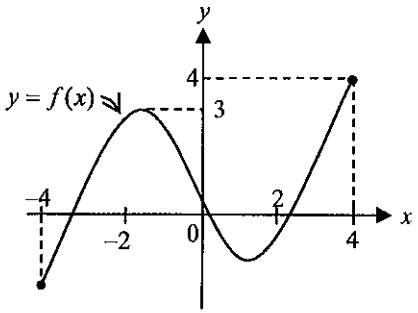
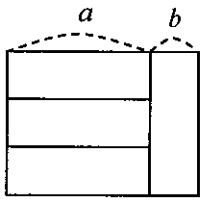


7. In the figure above, the graph of $y = f(x)$ is shown in $-4 \le x \le 4$. If $f(k) = 3$, how many values of k are there in the interval?

(A) 0
(B) 1
(C) 2
(D) 3
(E) 4



8. The figure shown above is composed of 4 equal rectangles. If the area of each rectangle is 48, what is the value of b?

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

9. The operation $a \odot b$ is defined by $a \odot b = \dfrac{a+b}{ab}$. If $k^2 \odot 2 = 1$, which of the following could be a possible value of k?

I. 2
II. $\sqrt{2}$
III. $-\sqrt{2}$

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

10. The profit p, in dollars, from a car wash is given by the function $p(x) = \dfrac{50x - 200}{x} + k$, where x is the number of cars washed and k is a constant. If 20 cars were washed today for a total profit of \$300, what is the value of k?

(A) 100
(B) 150
(C) 200
(D) 260
(E) 300

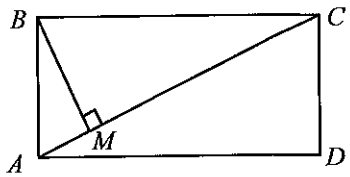
GO ON TO THE NEXT PAGE

11. In an art class, $\frac{2}{3}$ of the students are girls and $\frac{2}{5}$ of girls are seniors. If $\frac{1}{3}$ of senior girls have passed the final art test, which of the following could be the total number of students in the class?

(A) 15
(B) 20
(C) 30
(D) 45
(E) 60

12. If $a = 2b = 3c$, what is the average (arithmetic mean) of a, b, and c in terms of a?

(A) $\frac{a}{6}$
(B) $\frac{2a}{11}$
(C) $\frac{6a}{5}$
(D) $\frac{11a}{18}$
(E) $\frac{2a}{3}$



Note: Figure not drawn to scale.

13. In the figure above, $ABCD$ is a rectangle and $\overline{BM}$ is perpendicular to $\overline{AC}$. If the length of $\overline{AM}$ is 2 and the length of $\overline{CM}$ is 18, what is the area of $\triangle ABC$?

(A) 40
(B) 60
(C) 80
(D) 100
(E) 120

14. If $3 < p < 25$ and $12 < q < 16$, which of the following gives the set of all possible values of $\frac{p}{q}$?

(A) $0 < \frac{p}{q} < \frac{1}{4}$
(B) $\frac{1}{4} < \frac{p}{q} < \frac{25}{16}$
(C) $\frac{1}{4} < \frac{p}{q} < \frac{3}{16}$
(D) $\frac{3}{16} < \frac{p}{q} < \frac{25}{16}$
(E) $\frac{3}{16} < \frac{p}{q} < \frac{25}{12}$

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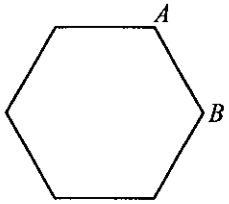


15. The figure above shows a regular hexagon. If the length of $\overline{AB}$ is k, what is the area of the hexagon in terms of k?

(A) $\frac{k^2}{3}$

(B) $\frac{2k^2}{3}$

(C) $\frac{3k^2}{2}$

(D) $\frac{3k^2\sqrt{3}}{2}$

(E) $4k^2\sqrt{3}$

16. After the first term, each term in a sequence is k times the preceding term and p is the first term of the sequence. If the ratio of the seventh term to the 3rd term is 16, what is a possible value of k?

(A) p

(B) $2p$

(C) 1

(D) 2

(E) 4

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 1	ANSWER KEY		
#	SECTION 3	SECTION 5	SECTION 7
1	D	E	C
2	D	C	B
3	B	A	A
4	C	E	D
5	E	B	B
6	E	A	D
7	C	B	C
8	A	D	A
9	C	55	E
10	A	3	D
11	D	80	D
12	B	25	D
13	E	3	B
14	E	80	E
15	D	15	D
16	A	$\frac{3}{2}$ or 1.5	D
17	A	$\frac{3}{2}$ or 1.5	
18	D	$\frac{25}{4}$ or 6.25	
19	D		
20	A		

TEST 1 SECTION 3

1. (D)

$Z = 2$, then $y = 3$,

and $x = 2y + 10 = 2(3) + 10 = 16$

---

2. (D)

$a_1 = 4$ and $d = 4$. Then

$a_{20} = 4 + 4(20 - 1) = 80$

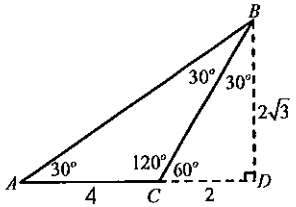
Or, use pattern.

$4, 8, 12, 16, 20, \ldots\ldots = 4(1, 2, 3, 4 \ldots\ldots 20)$.

Therefore, $4 \cdot 20 = 80$

---

3. (B)

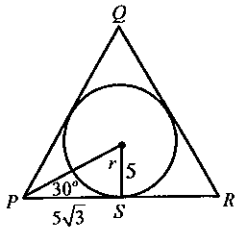


In the figure, the area of

$\triangle ABC = \frac{4 \times 2\sqrt{3}}{2} = 4\sqrt{3}$

---

4. (C)



In the figure, $PS = 5\sqrt{3}$, then $PR = 10\sqrt{3}$.

Therefore, Perimeter $= 3 \times 10\sqrt{3} = 30\sqrt{3}$.

---

5. (E)

$P(r \text{ and } r) = \frac{{}_3C_2}{{}_9C_2} = \frac{3}{36} = \frac{1}{12}$

Or, use product of probability. The probability of selecting a red marble first is $\frac{3}{9}$ and the probability of selecting a red marble second is $\frac{2}{8}$. Then, the probability is $\frac{3}{9}\times\frac{2}{8}=\frac{1}{12}$

---

6. (E)

Proportion. $\frac{^{s}k}{1}=\frac{^{s}p}{x}$. Therefore, $x=\frac{p}{k}$

---

7. (C)

Direction variation is, $y=kx$, where k is a constant. In the xy-plane, y-intercept must be 0.

---

8. (A)

$rs^2t^3u^3>0$ is simplified by dividing $r^2t^2u^2(\textit{positive})$.

That is, $rtu>0$. But $u<0$. Therefore, rt must be negative.

---

9. (C)

The speed $=\frac{D}{5}$, where D is a distance. And the new speed$=\frac{D}{4}$. Therefore, the % of increase

$$=\frac{\frac{D}{4}-\frac{D}{5}}{\frac{D}{5}}\times 100=25\%.$$

Or, you can use a convenient number, like 20 (multiple of 4 and 5). The speed $=\frac{20}{5}=4$ and the new speed $=\frac{20}{4}=5$. Therefore, the % of increase $=\frac{5-4}{4}\times 100=25\%$

---

10. (A)

$\frac{(p-3)p}{(p+5)(p-3)}=0$, where $p\neq -5$ and $p\neq 3$.

Then, sampling as follows. $\frac{p}{(p+5)}=0$.

Therefore, $p=0$.

---

11. (D)

Inverse proportion. $xy=k$. $20\times 4=10\times x$, $x=8$

---

12. (B)

The ratio of the areas of the circles $=1^2:2^2=1:4$

You can let the areas as x and $4x$. The area of the shaded region is $3x$. $3x=12$, $x=4$.

Therefore, the area of the smaller circle is 4.

---

13. (E)

The linear function has a constant slope.

$m=\frac{9-7}{3-2}=2$.

Between (2,7) and (a,b), the slope $=\frac{b-7}{a-2}=2$.

Therefore, $b=2a+3$.

---

14. (E)

The slope of line $\ell=-\frac{1}{3}$. Therefore,

The slope of the perpendicular line $=3$.

---

15. (D)

% of increase $=\frac{250-150}{150}\times 100=66\frac{2}{3}\%$.

---

16. (A)

The volume $=xyz$.

$(xy)(yz)(zx)=(20)(10)(18)$.

Therefore, $xyz=\sqrt{3600}=60$.

---

17. (A)

Two of three integers a,b, and c are odd. There are three possible cases.

$(a,b,c)\Rightarrow(O,O,E),(O,E,O),(E,O,O)$.

You can use numbers (1,1,2), (1,2,1), (2,1,1). Check the choices with the numbers. Choice I is always true.

---

18. (D)

$\frac{a+b}{2}=\frac{2ab}{a+b}\Rightarrow (a+b)(a+b)=4ab$

$a^2+2ab+b^2=4ab\Rightarrow (a-b)^2=0$.

Therefore, $a-b=0$. (A) and (C) are the answers for " could be true".

19. (D)

The length of the perimeter $= 4 \times \frac{360}{45} = 32$

$2\pi r = 32 \Rightarrow r = \frac{16}{\pi}$

The area of the sector $= \pi r^2 \times \frac{45}{360} = \frac{32}{\pi}$

---

20. (A)

Make a table.

	Boys	Girls	
10 ⇑	$\frac{9}{35}$		$\frac{2}{5}$
10 ⇓	$\frac{11}{35}$	$\frac{2}{7}$	$\frac{3}{5}$
	$\frac{4}{7}$	$\frac{3}{7}$	

$\frac{2}{3} \times \frac{3}{7} = \frac{2}{7} \Rightarrow$ Girl who are less the 10 years old.

You can fill the blanks with what you need.

Therefore, $\frac{\text{boys and } 10 \Uparrow}{\text{boys}} = \frac{\frac{9}{35}}{\frac{4}{7}} = \frac{9}{20}$

TEST 1 SECTION 5

1. (E)

$|k-5| \le 8$. (D) $|-4-5| = 9 \le 8$ (False)

---

2. (C)

---

3. (A)

The number must be less then $\frac{1}{4}$ of the votes,

that is,

$\frac{1}{4} \times 800 = 200$. Only (A) is the possible number.

---

4. (E)

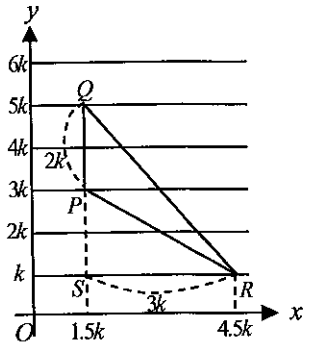
$a = 2b - 5$.

$\frac{a}{2b} = \frac{2b-5}{2b} = \frac{1}{2} \Rightarrow b = 5$, Therefore,

$2b = 10$

---

5. (B)



In the figure above, SR is the height. Therefore,

the area of $\triangle PQR = \frac{2k \times 3k}{2} = 12 \Rightarrow k = 2$

---

6. (A)

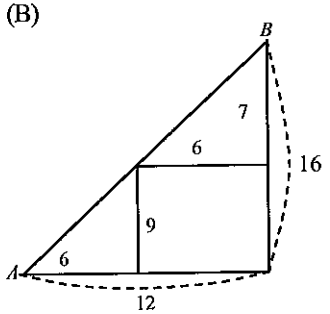
$\frac{x^2 y^{-3}}{z^2} = 9y \Rightarrow$

$x^2 = \frac{z^2}{y^{-3}}(9y) = 9y^4 z^2 \Rightarrow x = 3y^2 z$

Therefore, $x^{-1} = \frac{1}{3y^2 z}$

---

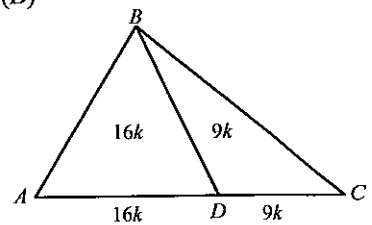
7. (B)



In the figure, $AB = \sqrt{12^2 + 16^2} = 20$

---

8. (D)



In the figure, the ratio of the areas is equal to the ratio of the lengths of the bases, because the two triangles have the same height.

9. 55

Proportion. $\frac{30}{3}=\frac{x}{5.5}\Rightarrow x=55$ miles.

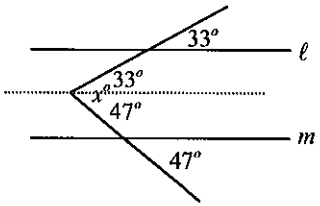
---

10. 3

$\left|6-k^2\right|=\left|k^2-6\right|=3\Rightarrow k^2-6=3\Rightarrow k=3.$

---

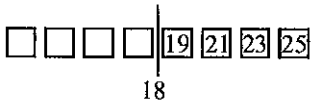
11. 80



In the figure, the angles are alternate angles.
$x=33+47=80$.

---

12. 25



The average is equal to the median.

---

13. 3

$f(2)=2-p=-1\Rightarrow p=3$

$f(2p)=f(6)=6-3=3$

---

14. 80

$3x+3y=180-30=150$. Then $x+y=50$

Therefore,

$2x+2y=100\Rightarrow \angle p=180-100=80$

---

15. 15

	$20g$ solution	$10g$ solution
A	$\frac{2g}{20g}$	$\frac{1g}{10g}$
B	$\frac{3g}{15g}$	$\frac{2g}{10g}$

The solute of solution is proportional to the weight.

Therefore, $\frac{1+2}{10+10}=\frac{3}{20}\Rightarrow\frac{3}{20}\times100=15\%$.

---

16. $\frac{3}{2}$ or 1.5

Translate. $\frac{2a+b}{2}=0.5\times4b\Rightarrow 2a+b=4b$

$a=\frac{3b}{2}\Rightarrow\frac{a}{b}=\frac{3b/2}{b}=\frac{3}{2}$

---

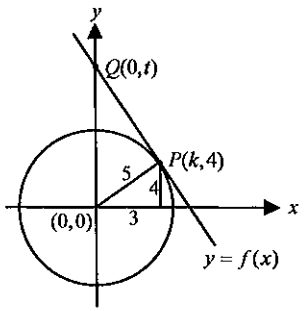
17. 1.5 or $\frac{3}{2}$

The length of each interval $=\frac{1}{4}=0.25$

$x^2-1=1.25\Rightarrow x^2=2.25\Rightarrow x=1.5$

---

18. $\frac{25}{4}$ or 6.25



In the figure above, $OP=5$. Then $k=3$. The slope of OP is $\frac{4}{3}$. Then the slope of $y=f(x)$ is $-\frac{3}{4}$. Therefore, $f(x)=-\frac{3}{4}x+b$.

$P(3,4)$ lies on the line.

$4=-\frac{3}{4}(3)+b\Rightarrow b=\frac{25}{4}$

TEST 1 SECTION 7

1. (C)

$\pi<n<\pi^2\Rightarrow$

$3.14<n<9.86\Rightarrow n=4,5,6,7,8,9$

---

2. (B)

$\sqrt{k+2}=k$

$k+2=k^2\Rightarrow k^2-k-2=(k-2)(k+1)=0$.

Therefore, $k=-1,\ 2$. But k cannot be negative.

3. (A)

$n(\text{own dog or cat}) = n(\text{dog}) + n(\text{cat}) - n(\text{own two})$

$(50-2) = (20) + (35) - n(\text{own two})$

Therefore, 7 people own both a dog and a cat.

The answer is $\frac{7}{50}$.

---

4. (D)

$b + 28 = a + 50 \Rightarrow a - b = -22$

$\Rightarrow |a-b| = 22$

---

5. (B)

Display the reading levels as follows.

1,2,3,3,4,4,4,5,5,5,6,6,7,7,7

The median is 8th number, 5.

---

6. (D)

$a > b$, $a^2 - b^2 = (a+b)(a-b) = 7$. Therefore,

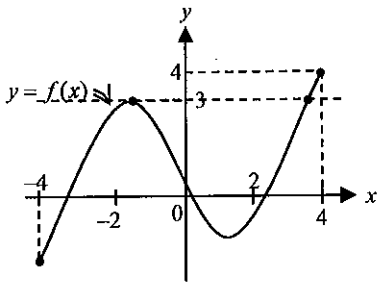
$a + b = 7$ and

$a - b = 1 \Rightarrow 2a = 8 \Rightarrow a = 4$ and $b = 3$.

$ab = (3)(4) = 12$

---

7. (C)



In the graph above, two points have a y-coordinate of 3.

---

8. (A)

In the figure, $a = 3b$ and $ab = 48$. Therefore,

$ab = (3b)b = 48 \Rightarrow b^2 = 16 \Rightarrow b = 4$.

---

9. (E)

$k^2 \odot 2 = \frac{k^2+2}{2k^2} = 1 \Rightarrow k^2 = 2 \Rightarrow k = \sqrt{2}$ or $-\sqrt{2}$

---

10. (D)

When $x = 20$, $p(x) = 300$. Therefore, the equation

$300 = \frac{50(20) - 200}{20} + k \Rightarrow k = 260$

---

11. (D)

The number of girls who passed the test is,

$n = \frac{1}{3} \times \frac{2}{5} \times \frac{2}{3} x$, where x is the number of students.

$n = \frac{4}{45} x$. Because n is integral number, x must be a multiple of 45.

---

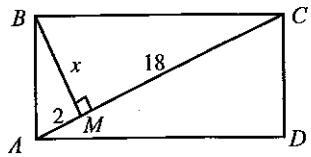
12. (D)

Average $= \frac{a+b+c}{3}$, where $b = \frac{a}{2}$ and $c = \frac{a}{3}$.

Average $= \frac{a + \frac{a}{2} + \frac{a}{3}}{3} = \frac{11a/6}{3} = \frac{11a}{18}$

---

13. (B)



From the similar triangles, $BM^2 = AM \times MC$

$x^2 = 2 \times 18 = 36$. Therefore, $x = 6$.

Therefore, the area of $\triangle ABC$ is $\frac{20 \times 6}{2} = 60$.

---

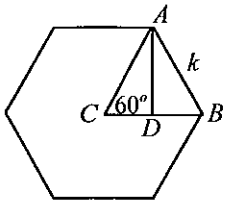
14. (E)

$3 < p < 25$

$12 < q < 16$

Therefore, $\frac{3}{16} < \frac{p}{q} < \frac{25}{12}$.

15. (D)



In the figure above, $BD = \frac{k}{2}$ and $AD = \frac{k}{2}\sqrt{3}$.

The area of $\triangle ABC = \frac{k \times \frac{k\sqrt{3}}{2}}{2} = \frac{k^2\sqrt{3}}{4}$.

Therefore, the area of hexagon is

$6 \times \frac{k^2\sqrt{3}}{4} = \frac{3k^2\sqrt{3}}{2}$.

---

16. (D)

The sequence is as follows. $p, pk, pk^2, pk^3 \ldots$

$\frac{pk^6}{pk^2} = k^4 = 16 \Rightarrow k = 2$

END

NO MATERIAL ON THIS PAGE