



SECTION 9

Time — 20 minutes

16 Questions

Turn to Section 9 (page 7) 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

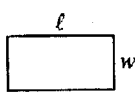
- The use of a calculator is permitted.
- All numbers used are real numbers.
- Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not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

Reference Information



$$A = \pi r^2$$

$$C = 2\pi r$$



$$A = \ell w$$



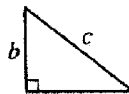
$$A = \frac{1}{2}bh$$



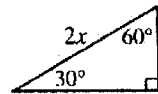
$$V = \ell wh$$



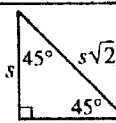
$$V = \pi r^2 h$$



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



Special Right Triangles



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

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

1. If $5t = 45$ and $tk = 1$, what is the value of k ?

- (A) $\frac{1}{45}$
 (B) $\frac{1}{9}$
 (C) $\frac{1}{5}$
 (D) 5
 (E) 9

$$\frac{5t}{5} = \frac{45}{5} \quad 9$$

$$t = 9$$

$$9 \cdot \frac{1}{9} = 1$$

(B)

2. It takes 4 complete turns of a crank to raise a window 2 inches. At this rate, how many turns does it take to raise the same window $3\frac{1}{2}$ inches?

- (A) 3.5
 (B) 7
 (C) 12
 (D) 14
 (E) 35

4 CRANKS FOR 2 INCHES
 1 CRANK FOR $\frac{1}{2}$ INCHES

$$3\frac{1}{2} = 7(\frac{1}{2})$$

SO 7 CRANKS

(B)

GO ON TO THE NEXT PAGE



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

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$

(C) 1

(D) $\frac{3}{2}$ (E) $\frac{9}{4}$

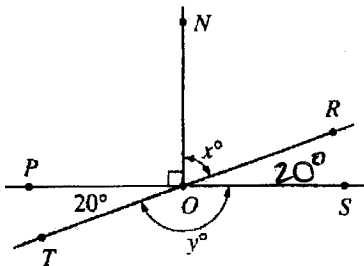
$$\frac{x}{y} = \frac{2}{3} \quad \text{CROSSMULTIPLY}$$

$$\frac{x}{y} \times \frac{3}{3} = \frac{2}{3} \times \frac{3}{3}$$

$$3x = 2y$$

SINCE THEY ARE EQUAL

$$\frac{3x}{2y} = 1 \quad (C)$$



4. In the figure above, \overline{PS} and \overline{TR} intersect at O and \overline{ON} is perpendicular to \overline{PS} . What is the value of $y - x$?

(A) 20

(B) 70

(C) 90

(D) 100

(E) 140

SUPPLEMENTARY

$$y + 20 = 180$$

$$y = 160$$

$$\angle ROS = 20^\circ \text{ (VERTICAL)}$$

COMPLEMENTARY $x + 20 = 90$

$$x = 70$$

$$y - x = 160 - 70$$

$$= 90 \quad (C)$$

SCHEDULE

Event	Beginning Time	Ending Time	
Session I	? 900	1030	1 1/2
Break	1030	1045	1/4
Session II	1045	1215	1 1/2
Lunch	1215	115	1
Session III	115	245	1 1/2
Break	245	300	1/4
Session IV	300	4:30 P.M.	1 1/2

5. In the schedule above, each session is to be $1\frac{1}{2}$ hours

long, each break is to be $\frac{1}{4}$ hour long, and lunch is to

be 1 hour long. If session IV is to end at 4:30 P.M., at

what time should session I begin?

(A) 8:15 A.M.

(B) 8:30 A.M.

(C) 8:45 A.M.

(D) 9:00 A.M.

(E) 9:15 A.M.

FILL CHART BACKWARDS

(D)

6. If $2x - 5$, $x + 1$, and $3x - 8$ are all integers and $x + 1$ is the median of these integers, which of the following could be a value for x ?

(A) 5

(B) 7

(C) 9

(D) 10

(E) 11

WORK BACKWARDS

FOR $x=5$

$$2 \cdot 5 - 5 = \underline{5}; \quad 5 + 1 = \underline{6} \quad 3 \cdot 5 - 8 = \underline{7}$$

(A)

GO ON TO THE NEXT PAGE



7. An exhibitor is selling decorative wreaths at an arts and crafts show. The net profit P , in dollars, from the sales of the wreaths is given by $P(n) = 0.75n - 50$, where n is the number of wreaths sold. How many wreaths must the exhibitor sell in order to earn a net profit of \$100?

- (A) 25
(B) 75
(C) 150
(D) 175
(E) 200

$$P(150) = 0.75(150) - 50$$

$$= \frac{3}{4}(150) - 50 \text{ NOT EVEN AND TOO LOW!}$$

$$P(175) = \frac{3}{4}(175) - 50 \text{ NOT EVEN}$$

$$P(200) = \frac{3}{4}(200) - 50 = 150 - 50 = 100 \text{ (E)}$$

8. If $x^2 + y^2 = 73$ and $xy = 24$, what is the value of $(x + y)^2$?

- (A) 73
(B) 97
(C) 100
(D) 121
(E) 144

$$(x + y)^2 = (x + y)(x + y)$$

FOIL

$$x^2 + xy + xy + y^2 =$$

$$x^2 + 2xy + y^2$$

REGROUP

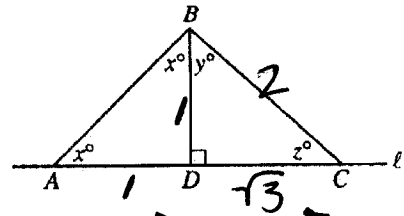
$$x^2 + y^2 + 2xy$$

SUBSTITUTE

$$73 + 2(24)$$

$$73 + 48$$

$$121 \text{ (D)}$$



Note: Figure not drawn to scale.

9. In the figure above, $AD = 1$ and $DC = \sqrt{3}$. What is the value of z ?

- (A) 15
(B) 20
(C) 25
(D) 30
(E) 35

$\triangle ADB$ is 45 45 90
SINCE $x^\circ = x^\circ$

$$\therefore \overline{BD} = 1$$

SINCE $\overline{BD} = 1$ AND $\overline{DC} = \sqrt{3}$

$\overline{BC} = 2$ AND $\triangle BDC$ is 30 60 90

$$z^\circ = 30^\circ \text{ (D)}$$

10. If 30 percent of 40 percent of a positive number is equal to 20 percent of w percent of the same number, what is the value of w ?

- (A) 80
(B) 60
(C) 50
(D) 15
(E) 10

$$\frac{30}{100} \left(\frac{40}{100} x \right) = \frac{20}{100} \left(\frac{w}{100} \right) x$$

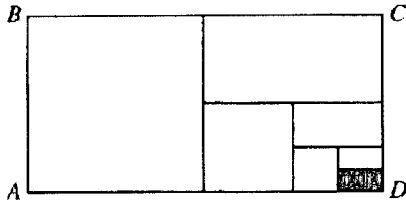
DIVIDE BOTH SIDES BY x

$$\left(\frac{30}{100} \right) \left(\frac{40}{100} \right) = \left(\frac{20}{100} \right) \left(\frac{w}{100} \right)$$

$$30 \cdot 40 = 20 \cdot w$$

$$1200 = 20w \quad w = 60 \text{ (B)}$$

GO ON TO THE NEXT PAGE



11. In the figure above, rectangle $ABCD$ is made up of seven nonoverlapping rectangles. The two smallest rectangles have the same area. Each of the other rectangles has twice the area of the next smaller rectangle. The area of the shaded rectangle is what fraction of the area of rectangle $ABCD$?

- (A) $\frac{1}{128}$
 - (B) $\frac{1}{64}$
 - (C) $\frac{1}{32}$
 - (D) $\frac{1}{16}$
 - (E) $\frac{1}{7}$
-

12. If $2x < y < 0$, which of the following is greatest?

- (A) $-2x$
- (B) $-(2x + y)$
- (C) $2x$
- (D) 0
- (E) $-y$

y IS NEGATIVE

SO IS x

SUBSTITUTE.

$$y = -1$$

$$x = -2$$

- (A) $-2(-2) = 4$
- (B) $-(2(-2) + (-1)) = 5$
- (C) -4
- (D) 0
- (E) -1 (B)

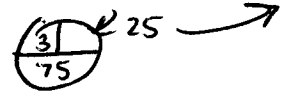
13. Carlos delivered n packages on Monday, 4 times as many packages on Tuesday as on Monday, and 3 more packages on Wednesday than on Monday. What is the average (arithmetic mean) number of packages he delivered per day over the three days?

- (A) $2n - 3$
- (B) $2n - 1$
- (C) $2n + 1$
- (D) $2n + 3$
- (E) $6n + 1$

SUBSTITUTE $n = 12$

M T W ~~2~~ ~~5~~

$$12 \quad 48 \quad 15 = 75 = 25$$



- (A) $2(12) - 3 = 21$
- (B) $2(12) - 1 = 23$
- (C) $2(12) + 1 = 25$
- (D) $2(12) + 3 = 27$
- (E) $6(12) + 1 = 73$

(C)

14. If $(a + b)^{\frac{1}{2}} = (a - b)^{-\frac{1}{2}}$, which of the following must be true?

- (A) $b = 0$
- (B) $a + b = 1$
- (C) $a - b = 1$
- (D) $a^2 + b^2 = 1$
- (E) $a^2 - b^2 = 1$

REWRITE

$$\sqrt{a+b} = \frac{1}{\sqrt{a-b}}$$

SQUARE BOTH SIDES

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

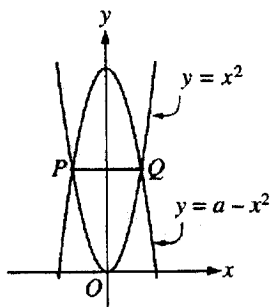
MULTIPLY BOTH SIDES BY $(a-b)$

$$(a+b)(a-b) = 1 \quad \text{FOIL}$$

$$a^2 + ab - ab - b^2 = 1 \quad (E)$$

$$a^2 - b^2 = 1$$

GO ON TO THE NEXT PAGE



15. The figure above shows the graphs of $y = x^2$ and $y = a - x^2$ for some constant a . If the length of \overline{PQ} is equal to 6, what is the value of a ?

- (A) 6
(B) 9
(C) 12
(D) 15
(E) 18

$y = x^2$ AND $y = a - x^2$
MUST INTERSECT WHEN $x = -3$
AND WHEN $x = +3$

SET $x = +3 \Rightarrow$

$$y = x^2 \text{ is } y = 3^2 \\ y = 9$$

THEREFORE, $Q = (3, 9)$ AND
 $P = (-3, 9)$

$y = a - x^2$ ALSO PASSES THROUGH

$$Q \Rightarrow 9 = a - (3)^2 \\ 9 = a - 9 \quad 18 = a$$

(E)

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.

16. Set X has x members and set Y has y members. Set Z consists of all members that are in either set X or set Y with the exception of the k common members ($k > 0$). Which of the following represents the number of members in set Z ?

- (A) $x + y + k$
(B) $x + y - k$
(C) $x + y + 2k$
(D) $x + y - 2k$
(E) $2x + 2y - 2k$

INVENT TWO SETS
THAT HAVE SOME COMMON
MEMBERS

$$X \{ 0, 1, 2, 3, 4, 5 \}$$

$$Y \{ 4, 5, 6, 7 \}$$

X has 6 MEMBERS ($x = 6$)

Y has 4 MEMBERS ($y = 4$)

$$Z \{ 0, 1, 2, 3, 6, 7 \}$$

There were 2 COMMON MEMBERS
($k = 2$)

Z has 6 MEMBERS

$$(a) 6 + 4 + 2 = 12 \text{ (a)}$$

$$(b) 6 + 4 - 2 = 8 \text{ (b)}$$

$$(c) 6 + 4 + 2(2) = 14 \text{ (c)}$$

$$(d) 6 + 4 - 2(2) = 6 \text{ (d)}$$

$$(e) 2(6) + 2(4) - 2(2) = 16 \text{ (e)}$$

(D)