Good Luck to _**Key**_ _____ Date _____ Pd ____

ACT Post-TEST: 10th Graders

Since there are 25 questions you get 35 minutes. Do your best! Place the CAPITAL LETTER in the box provided.

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MATHEMATICS TEST
60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

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1. The length of a rectangle is 3 times the length of a smaller rectangle. The 2 rectangles have the same width. The area of the smaller rectangle is *A* square units. The area of the larger rectangle is *kA* square units. Which of the following is the value of *k*?

   A. $\frac{1}{9}$
   B. $\frac{1}{3}$
   C. 1
   D. 3
   E. 9

   (answer box: D)
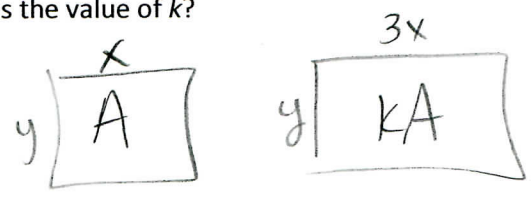
2. $(a + 2b + 3c) - (4a + 6b - 5c)$ is equivalent to:

   F. $-4a - 8b - 2c$
   G. $-4a - 4b + 8c$
   H. $-3a + 8b - 2c$
   J. $-3a - 4b - 2c$
   K. $-3a - 4b + 8c$

   (answer box: K)

   $$a + 2b + 3c$$
   $$-4a - 6b + 5c$$
   $$\overline{\qquad}$$
   $$-3a - 4b + 8c$$

3. In right triangle ΔACE below, $\overline{BD}$ is parallel to $\overline{AE}$, and $\overline{BD}$ is perpendicular to $\overline{EC}$ at D. The length of $\overline{AC}$ is 20 feet, the length of $\overline{BD}$ is 3 feet, and the length of $\overline{CD}$ is 4 feet. What is the length, in feet, of $\overline{AE}$?
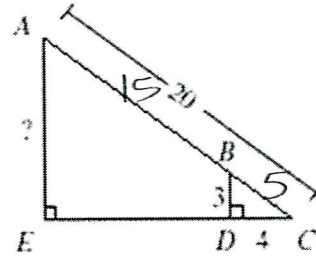
A. 10
B. 12
C. 15
D. 16
E. 17
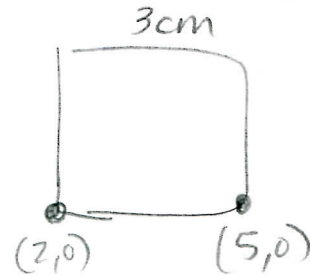
$$\frac{5}{3} = \frac{20}{x}$$

$5x = 60$

$x = 12$

4. The sides of a square are 3 cm long. One vertex of the square is at (2, 0) on a square coordinate grid marked in centimeter units. Which of the following points could also be a vertex of the square?

F. (-4, 0)
G. (0, 1)
H. (1, -1)
J. (4, 1)
K. (5, 0)

3cm

(2,0)   (5,0)

5. A bag contains 12 red marbles, 5 yellow marbles, and 15 green marbles. How many additional red marbles must be added to the 32 marbles already in the bag so that the probability of randomly drawing a red marble is $\frac{3}{5}$?

A. 13
B. 18
C. 28
D. 32
E. 40

$\frac{12}{32} = .375$

$\frac{30}{50} = .6$

$\frac{x}{32} = \frac{3}{5}$

$5x = 96$

$x = 19.2$

$\frac{3}{5} = .6$

$\frac{x}{32} = .6$

19.2

6. The figure below consists of a square and 2 semicircles, with dimensions as shown. What is the outside perimeter, in centimeters, of the figure?
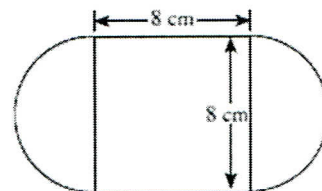
F. $8 + 8\pi$
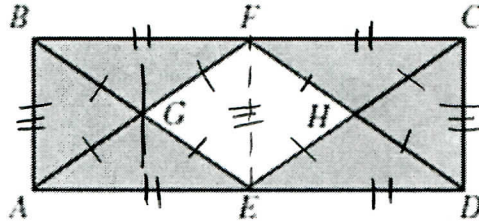G. $16 + 8\pi$
H. $16 + 16\pi$
J. $32 + 8\pi$
K. $32 + 16\pi$

$2\pi r + 16$

$2\pi(4) + 16$

$8\pi + 16$

|←— 8 cm —→|

8 cm

7. In the figure below, points E and F are the midpoints of sides $\overline{AD}$ and $\overline{BC}$ of rectangle ABCD, point G is the intersection of $\overline{AF}$ and $\overline{BE}$, and point H is the intersection of $\overline{CE}$ and $\overline{DF}$. The interior of ABCD except for the interior of EGFH is shaded. What is the ratio of the area of EGFH to the area of the shaded region?

A. 1:2
B. 1:3
C. 1:4
D. 1:6
E. Cannot be determined from the given information

8. The coordinates of the endpoints of $\overline{CD}$, in the standard (x, y) coordinate plane, are (-4, -2) and (14, 2). What is the x-coordinate of the midpoint of $\overline{CD}$?

$\left(\dfrac{-4+14}{2}\right)$ $\dfrac{10}{2} = 5$

F. 0
G. 2
H. 5
J. 9
K. 10
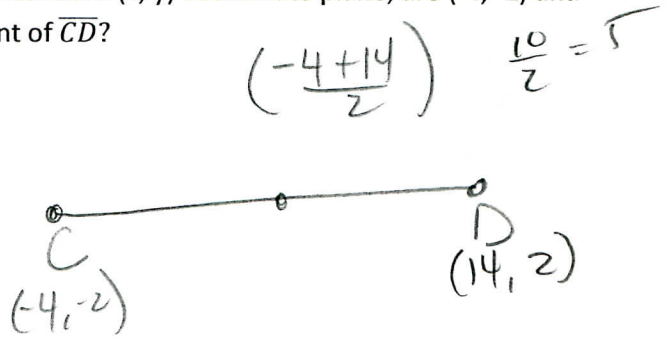
9. The equations below are linear equations of a system where a, b, and c are positive integers.

$ay + bx = c$ $y = -\dfrac{b}{a}x + \dfrac{c}{a}$
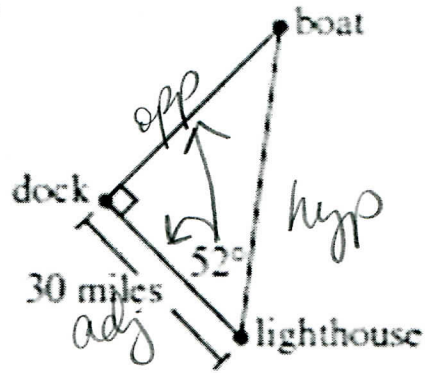
$ay - bx = c$ $y = \dfrac{b}{a}x + c$

Which of the following describes the graph of at least 1 such system of equations in standard (x, y) coordinate plane?

I. 2 parallel lines   no slope will be the same
II. 2 intersecting lines
III. A single line   not the same slope cannot be the same line

A. I only
B. II only
C. III only
D. I or II only
E. I, II, or III

10. According to the measurements given in the figure below, which of the following expressions gives the distance, in miles, from the boat to the dock?

SOH CAH [TOA]

F. 30 tan 52°
G. 30 cos 52°
H. 30 sin 52°
J. $\frac{30}{\cos 52°}$
K. $\frac{30}{\sin 52°}$

$\tan 52° = \frac{x}{30}$

(handwritten figure: boat, dock, lighthouse triangle with 30 miles, 52°, opp, hyp, adj labels)

F

11. In the figure below, $\overline{AB}//\overline{CD}$, $\overline{AE}$ bisects ∠BAC, and $\overline{CE}$ bisects ∠ACD. If the measure of ∠BAC is 82°, what is the measure of ∠AEC?

$m∠A + m∠C = 180$

SSIA R Supp when //

(handwritten figure with points A, B, C, D, E; angles 41, 41, 49)

A. 86°
B. 88°
C. 90°
D. 92°
E. Cannot be determined from the given information

C
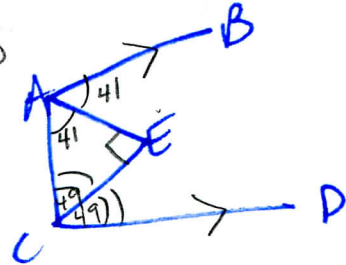
12. Triangles ΔABC and ΔPQR are shown below. The given side lengths are in centimeters. The area of ΔABC is 30 square centimeters. What is the area of ΔPQR, in square centimeters?

(handwritten figures: triangle ABC with 70° at B, 30cm², side x, y, base 7; triangle PQR with 110° at Q, side x, y, base 7)

smaller AC bigger ht
bigger PR smaller ht
same area

F. 15
G. 19
H. 25
J. 30
K. 33

J
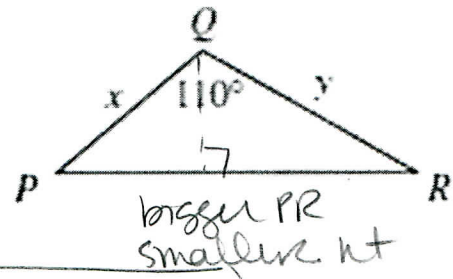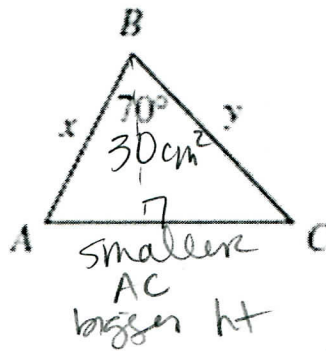
13. The monthly fees for single rooms at 5 colleges are $370, $310, $380, $340, and $310, respectively. What is the mean of these monthly fees?

arithmetic mean

$\frac{370 + 310 + 380 + 340 + 310}{5} = \frac{1710}{5} = 342$

A. $310
B. $340
C. $342
D. $350
E. $380

C

The figure below shows the design of a circular stained-glass panel on display at Hopewell's Antique Shop. Seams separate the pieces of the panel. All red triangular pieces shown are congruent and have a common vertex with each adjoining triangular piece. The 2 square shown are inscribed in the circle. The diameter of the panel is 2 feet.
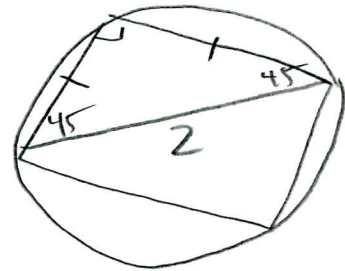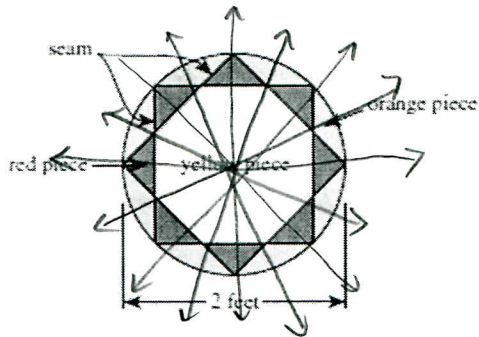
14. The design of the stained-glass panel has how many lines of symmetry in the plane of the panel?

F. 2
G. 4
H. 8
J. 16
K. Infinitely many

15. What is the area of the stained-glass panel, to the nearest 0.1 square foot?

A. 3.1
B. 4.0
C. 6.2
D. 8.0
E. 12.6

$$A = \pi r^2 = \pi(1)^2 = \pi(1) \approx 3.1$$

16. Kaya wants to install a new circular stained-glass window in her living room. The design of the window will be identical to that of the panel. The diameter of the new window will be 75% longer than the diameter of the panel. The new window will be how many feet in diameter?
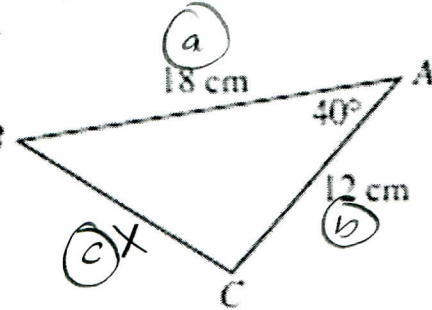
F. 1.50
G. 2.50
H. 2.75
J. 3.50
K. 4.00

$$2(.75) = 1.5$$
$$2 + 1.5 = 3.5$$

3.5 ft
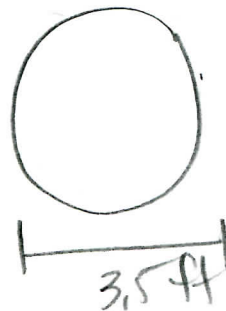
17. Triangle ΔABC is shown in the figure below. The measure of ∠A is 40°, AB = 18 cm, and AC = 12 cm. Which of the following is the length, in centimeters, of $\overline{BC}$?

(NOTE: For a triangle with sides of length a, b, and c opposite angles ∠A, ∠ B, and ∠C, respectively, the law of sines states $\frac{sin\ \angle A}{a} = \frac{sin\ \angle B}{b} = \frac{sin\ \angle C}{c}$ and the law of cosines states $c^2 = a^2 + b - 2ab\ cos\ \angle C$.)
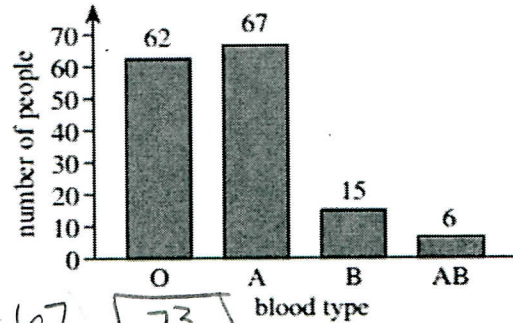
SOH CAH TOA

$\frac{\sin 40}{X} = \frac{\sin B}{12}$

A. 12 sin 40°
B. 18 sin 40°
C. $\sqrt{18^2 - 12^2}$
D. $\sqrt{12^2 + 18^2}$
E. $\sqrt{12^2 + 18^2 - 2(12)(18)\ cos\ 40^o}$

$\sqrt{c^2} = \sqrt{(18)^2 + (12)^2 - 2(12)(18)\ cos\ 40}$

18. The blood types of 150 people were determined for a study as shown in the figure below. If a person from this study is randomly selected, what is the probability that this person has either Type A or Type AB blood?

F. $\frac{62}{150}$
G. $\frac{66}{150}$
H. $\frac{68}{150}$
J. $\frac{73}{150}$
K. $\frac{84}{150}$

$P(A \cup AB) = \frac{6 + 67}{150}$ $\boxed{\frac{73}{150}}$

$A = \frac{67}{150}$ $AB = \frac{6}{150}$

19. On a particular road map, $\frac{1}{2}$ inch represents 18 miles. About how many miles apart are 2 towns that are $2\frac{1}{2}$ inches apart on this map?

A. 18
B. $22\frac{1}{2}$
C. 36
D. 45
E. 90

$\frac{\frac{1}{2}}{2\frac{1}{2} = \frac{5}{2}} = \frac{18}{X}$

$\frac{1}{2}x = 45$

$\boxed{X = 90}$

24. In scientific notation, $670,000,000 + 700,000,000 = ?$

F. 1.37×10^{-9}
G. 1.37×10^{7}
H. 1.37×10^{8}
J. 1.37×10^{9}
K. 137×10^{15}

Handwritten work:
1370000000
1.37×10^{9}

25. To make a 750-piece jigsaw puzzle more challenging, a puzzle company includes 5 extra pieces in the box along with the 750 pieces, and those 5 extra pieces do not fit anywhere in the puzzle. If you buy such a puzzle box, break the seal on the box, and immediately select 1 piece at random, what is the probability that it will be 1 of the extra pieces?

A. $\dfrac{1}{5}$
B. $\dfrac{1}{755}$
C. $\dfrac{1}{750}$
D. $\dfrac{5}{755}$
E. $\dfrac{5}{750}$

Handwritten work:
$\dfrac{5}{755}$