Heart of Algebra Drill 2

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. If $3w < 27$, then which of the following describes all possible values of w ?

   A) $w > 9$
   B) $w > 7$
   C) $w < 8$
   D) $w < 9$

2. If $6t + 2 < 26$, then which of the following is a possible value for t ?

   A) 3.5
   B) 4
   C) 4.5
   D) 5

3. If $x > 6(x - 5)$, then which of the following must be true?

   A) $x > 6$
   B) $x > 5$
   C) $x < 6$
   D) $x < -6$

4. If $-13 \leq -2z - 3 \leq 1$, then which of the following describes all possible values of z ?

   A) $-5 \leq z \leq 2$
   B) $-2 \leq z \leq 5$
   C) $2 \leq z \leq 5$
   D) $-5 \leq z \leq -2$

5. If $7s - 14 \leq 4 + 6s$, which of the following must be true?

A) $s \geq 17$
B) $s \leq 18$
C) $s < 19$
D) $s < 18$

6. If $8 < -16 - 3c$, which of the following describes all possible values of c ?

A) $c > 8$
B) $c > 9$
C) $c < -9$
D) $c < -8$

7. If $\left(\frac{3d}{2}\right)\left(\frac{8d}{3}\right) \leq 1$, which of the following inequalities must be true?

A) $d \leq \frac{1}{4}$

B) $d \leq \frac{1}{2}$

C) $-\frac{1}{4} \leq d \leq \frac{1}{4}$

D) $-\frac{1}{2} \leq d \leq \frac{1}{2}$

8. For all z such that $z > 0$, the square of one-half z is greater than 1 but less than 4. Which of the following inequalities gives all possible values of z ?

A) $2 < z < 4$
B) $\sqrt{2} < z < \sqrt{8}$
C) $1 < z < 16$
D) $2 < z < 32$

9. When selecting a scarf pattern to knit, Victoria will only choose a pattern that requires at least 480 rows and no more than 520 rows. If r represents a number of rows that she will not knit, an inequality that represents all possible values of r is

A) $|r - 20| > 20$
B) $|r - 500| > 20$
C) $|r - 500| < 20$
D) $|r + 100| > 20$

Passport to Advanced Math Drill 2

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. Cube A has a volume of 3 ft^3. Cube B has a volume of 9 ft^3. Which of the following expresses the ratio of the side length of cube A to the side length of cube B?

   A) $3^{\frac{1}{2}} : 3^2$
   B) $3 : 3^{\frac{2}{3}}$
   C) $3^{\frac{1}{3}} : 3^{\frac{2}{3}}$
   D) $3^3 : 3^5$

2. $2x^3 + 4x^2 + 2x =$

   A) $2x(x - 1)^2$
   B) $2(x + 1)^3$
   C) $2x(x + 1)^2$
   D) $x(x + 2)^2$

3. $4x^2 + 12x + 14 =$

   A) $(2x + 6)^2 - 18$
   B) $(2x + 3)^2 + 5$
   C) $(4x + 3)^2 + 5$
   D) $(2x - 3)^2 + 5$

4. The standard form of the equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$, where the center of the circle is at point (h, k) and the radius of the circle is r. What is the standard form of the equation of the circle defined by the equation $x^2 + y^2 - 6x + 8y = 0$?

   A) $(x - 6)^2 + (y + 8)^2 = 0$
   B) $(x + 3)^2 + (y + 4)^2 = 25$
   C) $(x - 3)^2 + (y + 4)^2 = 25$
   D) $(x - 3)^2 + (y + 4)^2 = 5$

5. $x^{\frac{2}{3}}+8y^{\frac{5}{3}}=$

A) $\sqrt[3]{x^2+8y^5}$

B) $\sqrt[3]{x^2+512y^5}$

C) $\sqrt[3]{x^2}+\sqrt[3]{512y^5}$

D) $\sqrt[3]{x^2+2y^5}$

6. Which of the following expressions is NOT equal to $4x^2 - 32x + 64$?

A) $4(x^2 - 8x + 16)$
B) $(2x - 8)^2$
C) $4(x + 4)(x - 4)$
D) $4(x - 4)^2$

7. Which of the following is equivalent to $x^{24} - 18x^{12} + 82$?

A) $(x^{12} - x^6\sqrt{18})^2 + 82$
B) $x^{24} + 18x^{12} - 18x^{12} + 82$
C) $(x^{12} - 9)^2 + 1$
D) $(x^2 - 9)^{12} + 1$

8. Which of the following accurately rewrites the expression $\frac{5 \cdot 3^{2t-1}}{6 \cdot 2^{t+1}}$ in the form $A \cdot B^t$?

A) $\frac{5}{6} \cdot \left(\frac{9}{2}\right)^t$

B) $\frac{5}{4} \cdot \left(\frac{9}{2}\right)^t$

C) $\frac{5}{36} \cdot \left(\frac{3}{2}\right)^t$

D) $\frac{5}{36} \cdot \left(\frac{9}{2}\right)^t$

Problem Solving and Data Analysis Drill 2

This section contains two types of questions. For multiple-choice questions, solve each problem and circle the letter of the answer that you think is the best of the choices given. For Student-Response questions, denoted by the grid-in icon, write your answer in the blank space provided.

1. The density of silver is 10.5 grams per cubic centimeter. If a nugget of silver weighs 2,100 grams, what is the volume of the nugget, in cubic centimeters?

2. One liter of water has a mass of 1000 grams. If there are 1000 milliliters in a liter, and 1 milliliter is equal to 1 cubic centimeter, what is the density of water, in grams per cubic centimeter?

   A) 1
   B) 1.1
   C) 10
   D) 11

3. A block of copper weighs 2,230 grams and measures 10 cm by 5 cm by 5 cm. Given that density is mass divided by volume, what is the density of copper in grams per cubic centimeter?

   A) 0.11
   B) 8.92
   C) 44.6
   D) 89.2

4. One match releases approximately 1,100 joules of heat energy when it is lit. If 1 joule equals 0.239 calories, how many of these matches must be lit to produce 2,100 calories of heat energy?

   A) 2
   B) 3
   C) 8
   D) 62

5. A certain 3D printer creates objects by building layers on top of each other. The average layer thickness is 102 μm (micrometers). There are 1,000,000 micrometers in a meter, and 1 inch equals 0.0254 meters. Approximately how many layers are needed to print an object one inch thick?

A) 250
B) 630
C) 2,540
D) 4,015

6. A certain 3D printer has a maximum build volume of 230 mm × 170 mm × 200 mm. If 1 inch equals 25.4 millimeters, which of the following is the best approximation of the printer's maximum build volume in cubic inches?

A) 782
B) 477
C) 308
D) 148

7. A typical race car is travelling at its maximum speed along a straight section of track. The distance it covers in 1 second is equal to the length of a football field, which is 120 yards or 360 feet. Given that there are 5,280 feet in a mile, what is the race car's maximum speed, in miles per hour?

A) 27
B) 82
C) 245
D) 528

8. During the typical Indy 500, the average pit stop is 15 seconds long and involves 6 crew members. Each of the 33 cars that race makes an average of 5 stops per race. If all cars finish the race, using full crews and making the expected number of pit stops, what is the total number of active work hours put in by the crews during pit stops?

A) 4.125
B) 41.25
C) 206.25
D) 247.5

9. Superman can run so fast that he can run on water as well as land, and he never gets tired. His average running speed is Mach 4, or 4 times the speed of sound. For fun, he decides to run around the Earth's equator, a distance of 40,075 kilometers. If the speed of sound is 340.29 meters per second, and there are 1,000 meters in a kilometer, approximately how many hours will it take for Superman to complete his run?

A) 1.5
B) 8
C) 29
D) 118

Additional Topics Drill 2

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. If $0 < x < \frac{\pi}{2}$ and $\sin x = y$, what is the value of $\cos\left(\frac{\pi}{2} - x\right)$ in terms of y?

A) $-y$
B) y
C) y^2
D) $1 - y^2$

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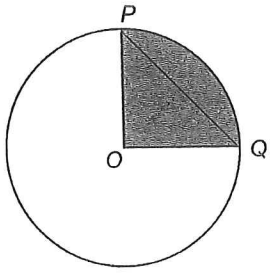
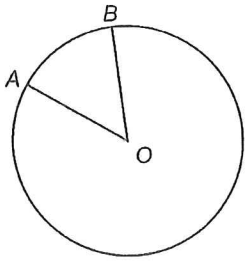
2. Minor arc PQ in circle O below is 2π. If $\angle PQO$ is 45°, what is the area of the shaded region?



A) 2π
B) 4π
C) 8π
D) 16π

3. Points A and B lie on circle O as shown below. $\angle BOA$ is 45°. If the area of circle O is 64π, what is the length of minor arc AB?



A) 2π
B) 4π
C) 8π
D) 16π

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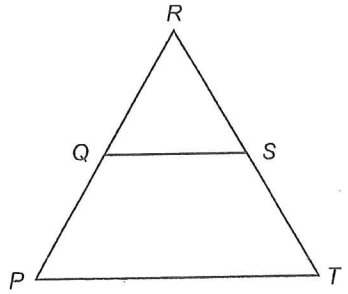
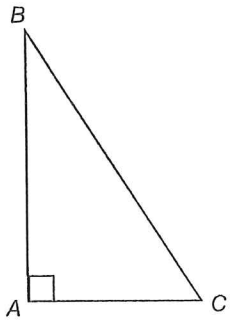
4. In the figure below, $\overline{QS}$ and $\overline{PT}$ are parallel. If $\overline{RS} = 8$, $\overline{PR} = 16$, and $\overline{PT} = 10$, what is the length of $\overline{QS}$?



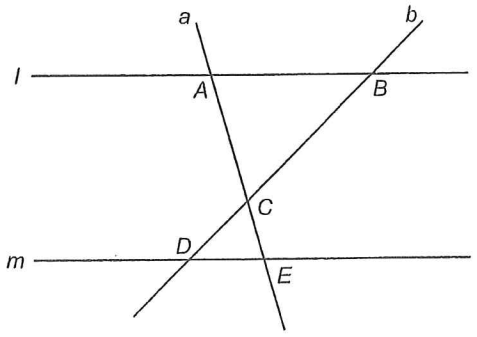
A) 5
B) 8
C) 10
D) 16

5. Right triangle ABC, shown below, has a base of 4 inches and a hypotenuse of 8 inches. If the height of the triangle is between 4 in and 8 in, what is the angle measure of $\angle C$?



A) 30
B) 45
C) 60
D) 90

6. Lines l and m, shown below, are parallel. Lines a and b intersect as shown. If segment DE is 12 and CE is 6, which is the length of AB if AC is 18?



A) 9
B) 18
C) 24
D) 36