EXERCISE 5: Answers for this exercise start on page 314.

1

Which expression is equivalent to $\sqrt{100x^{36}}$?

A) $10x^6$
B) $50x^6$
C) $10x^{18}$
D) $50x^{18}$

2

If $(5^3)^{4k} = (5^{\frac{1}{3}})^{24}$, what is the value of k ?

A) -6
B) $\frac{2}{3}$
C) $\frac{3}{4}$
D) 2

3

Which of the following is equivalent to $3y^{\frac{1}{2}}$ for all $y > 0$?

A) $\sqrt{3y}$
B) $\sqrt{9y}$
C) $\sqrt{\frac{3}{y}}$
D) $\sqrt{\frac{9}{y}}$

4

Which expression is equivalent to 4^{m+2} ?

A) 16^m
B) $16 + 4^m$
C) $8(4^m)$
D) $16(4^m)$

5

Which expression is equivalent to $\sqrt[4]{x^2y^4}$, where $x > 0$ and $y > 0$?

A) $\sqrt{xy}$
B) $y\sqrt{x}$
C) $\frac{1}{x^2}$
D) x^2y

6

Which expression is equivalent to $p^{\frac{1}{3}} \cdot (\sqrt[3]{p})^2$, where p is greater than 0 ?

A) $p^{\frac{2}{3}}$
B) $p^{\frac{2}{9}}$
C) $p^{\frac{7}{3}}$
D) p

7

Which expression is equivalent to $x^{\frac{2a}{b}}$ for all positive values of x, where a and b are positive integers?

A) $\sqrt[b]{ax^2}$
B) $\sqrt[b]{x^{2a}}$
C) $\sqrt[b]{x^{a+2}}$
D) $\sqrt[2a]{x^b}$

8

If $\frac{9^7}{\sqrt[4]{9^{10}}} = 9^{6t}$, what is the value of t ?

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9

Which expression is equivalent to $a^{\frac{3}{4}}b^{\frac{1}{2}}$, where $a \geq 0$ and $b \geq 0$?

A) $\sqrt[4]{a^3b}$

B) $\sqrt[4]{a^3b^2}$

C) $\sqrt{a^3b}$

D) $\sqrt{a^4b^2}$

10

Which expression is equivalent to $h^{\frac{5}{12}}(h^{-\frac{1}{4}})^{\frac{7}{3}}$, where $h > 0$?

A) $\frac{1}{h^6}$

B) $\sqrt{h^5}$

C) $\frac{1}{\sqrt[6]{h}}$

D) $\frac{1}{\sqrt[5]{h^2}}$

11

$$\frac{\sqrt[8]{41k}\left(\sqrt[9]{41k}\right)^{12}}{}$$

For what value of x is the given expression equivalent to $(41k)^{25x}$, where $k > 1$?

12

The expression 4^{18x} is equivalent to k^{3x}, where k is a constant. What is the value of k?

13

Which expression is equivalent to $9^{\frac{1}{n}}(4^{\frac{1}{2n}})$, where n is a positive integer?

A) $24^{\frac{1}{n}}$

B) $12^{\frac{1}{n}}$

C) $\sqrt[n]{18}$

D) $\sqrt[n]{6}$

14

$$\frac{10\sqrt[6]{9^3x^{48}}}{\sqrt[4]{6^4x}}$$

The given expression is equivalent to ax^b, where $a > 0$, $b > 0$, and $x > 1$. What is the value of ab?

15

If m and n are both positive numbers, and $4m$ is equal to the cube root of the square of n, for what value of x is m^x equal to n when $m = 2$?

16

If $2^{x+3} - 2^x = k(2^x)$, what is the value of k?

A) 3

B) 5

C) 7

D) 8

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6. Of all eligible voters in Columbus, 40% actually voted in the election. How many total eligible voters did Columbus have?

(A) 248,000
(B) 875,000
(C) 1,550,000
(D) 2,487,500

7. Suppose that a survey of total 200 randomly selected voters from both cities accurately predicted the results of the election. How many of the people surveyed would have been supporters of Candidate A from Columbus?

(A) 50
(B) 70
(C) 113
(D) 132

Questions 8—9 use the following table.

Grade	Test 1	Project 1	Test 2	Project 2	Total
A	5	8	9	7	29
B	7	6	5	10	28
C	6	7	4	5	22
D	4	1	3	2	10
F	1	1	3	0	5
Total	23	23	24	24	94

8. The median letter grade for assignments in the class is:

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

9. For which assignment is the standard deviation of the grade results the least?

(A) Test 1
(B) Project 1
(C) Test 2
(D) Project 2

10. An online shopping site allows customers to post 1-star, 2-star, 3-star, 4-star, and 5-star reviews for products. If an item currently has an average star rating of 2.3 based on a total of 10 reviews, what is the minimum number of reviews that could bring up the overall average rating to at least a 3.0?

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

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Geometry and Trigonometry Drill

1. A box in the shape of a rectangular prism has dimensions 20 inches by 30 inches by 12 inches. Inside the box are four solid cubes, each with edge lengths of 4 inches. If the inside of the larger box is empty except for the solid cubes, what is the volume of empty space in the box?

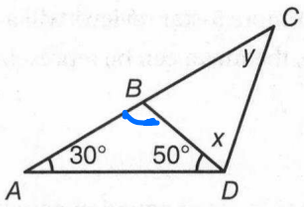
   (A) 248 cubic inches
   (B) 1,800 cubic inches
   (C) 6,944 cubic inches
   (D) 7,200 cubic inches

   Vol of the prism - Vol of 4 cubes

2. A right triangle has a hypotenuse of 10 inches and legs that measure 8 inches and 6 inches. What is the area of the triangle in square inches?

   (A) 12
   (B) 18
   (C) 24
   (D) 36

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$\angle ABD = \angle x + \angle y$

$\angle DBC = 180° - \angle x - \angle y$. $\angle DBC = 180° - \angle ABD$

3. In triangle ACD above, point B is on $\overline{AC}$, and B and D form a line. What is the sum of $\angle x$ and $\angle y$ in degrees?

$\angle ABD = 180° - 30° - 50° = 100°$

$\angle x + \angle y = \angle ABD = 100°$

(A) 100
(B) 110
(C) 120
(D) 140

4. If a circle has the equation $(x-4)^2 + (y-6)^2 = 9$, what is the equation of the circle if it is reflected directly across the x-axis?

(A) $(x+4)^2 + (y+6)^2 = -9$
(B) $(x-4)^2 - (y+6)^2 = -9$
(C) $(x+4)^2 - (y+6)^2 = 9$
(D) $(x-4)^2 + (y+6)^2 = 9$

5. If the area of an equilateral triangle is $2\sqrt{3}$ square units, what is the perimeter of the triangle?

(A) 6
(B) $4\sqrt{3}$
(C) $6\sqrt{2}$
(D) $6\sqrt{3}$

6. Given that $\angle X$ is between 0 and 90 degrees, and that $\cos X = Y$, what is the *sine* of an angle with the measure $(90 - X)$ degrees?

(A) $90 - Y$
(B) Y
(C) $\frac{2}{3}$
(D) 90

7. An angle measuring 3π radians would be equivalent to how many angles with a measure of 45°?

(A) 4
(B) 8
(C) 9
(D) 12

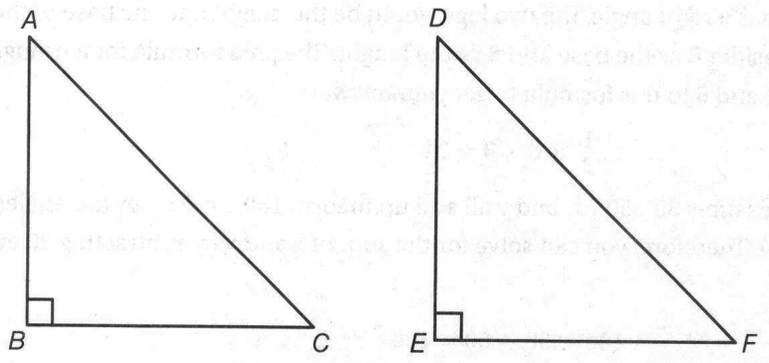
$\pi = 180°$

$180° = 4 \cdot 45°$

$3\pi = 3 \cdot 4 \cdot 45°$

12

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8. Triangles ABC and DEF are similar to one another. If the cosine of $\angle BAC$ is $\frac{12}{13}$, and the length of $\overline{DE}$ is 24 units, what is the length of $\overline{DF}$?

(A) 14
(B) 20
(C) 26
(D) 30

9. Over a 20-second time period, Jeff runs in a circle of 8 feet in radius around a pole. Assuming that Jeff starts the time period at a radius of 8 feet from the pole, the graph during this interval of his time (as the x-coordinates) and his distance from the pole (as the y-coordinates) would have a slope of what?

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

10. A rectangular dog park is x feet wide and y feet long. The park is to be fenced in along its sides with wooden material, except for part of one side where there will be a metal gate that is g feet long. How long must the fence material be in order to meet these conditions?

(A) $2x + 2y - g$
(B) $2x + 2y + g$
(C) $xy - g$
(D) xyg

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Mixed Drill

1. Which of the following lines is perpendicular to $5y - 2.5x = -10$?

(A) $y = -2x + 8$
(B) $y = 0.5x + 2$
(C) $y = 2x - 7$
(D) $y = 0.4x + 10$

$5y = 2.5x - 10$

$y = \frac{1}{2}x - 2$

$\frac{1}{2} \cdot k = -1 \qquad k = -2$

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Questions 2–3 use the following table.

Hours of Sleep per Night

	More Than 8	6–8	Less Than 6	Total
Under Age 13	15	8	1	24
Ages 13–18	13	17	14	44
Ages 19–22	18	12	20	50
Total	46	37	35	118

2. The least possible median age of those surveyed would be which of the following?

(A) 13
(B) 15
(C) 19
(D) Cannot be determined from the given information

3. The mean number of hours of sleep of all those surveyed is

(A) 6.5
(B) 7.5
(C) 8.5
(D) Cannot be determined from the given information

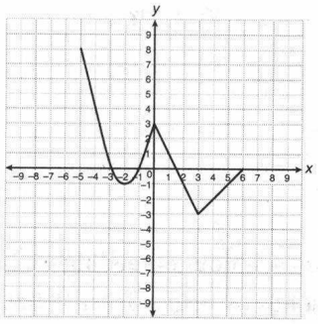
4. For values of a not equal to zero, $\left(\frac{2}{\sqrt[3]{a}}\right)^6$ equals

(A) 2a−2
(B) 12a−2
(C) $64a\frac{1}{2}$
(D) $64a^{-2}$

$2^6 = 64$ $\quad \frac{1}{\sqrt[3]{a}} = a^{-\frac{1}{3}}$

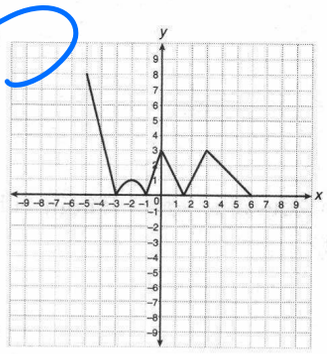
$(a^{-\frac{1}{3}})^6 = a^{-2}$

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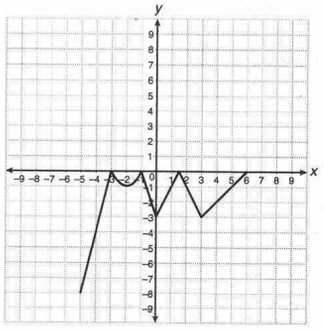


5. The graph of $y = f(x)$ is shown above. Which of the following graphs best represents the graph of $y = |f(x)|$?

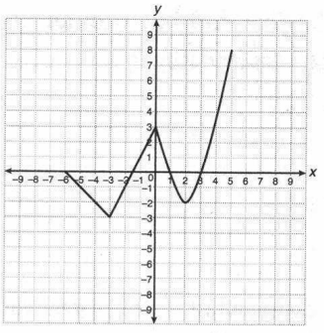
(A)



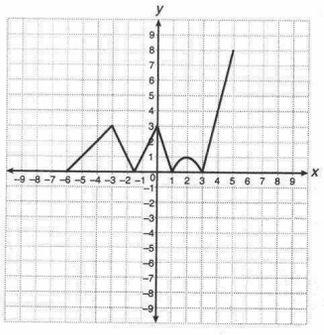
(B)



(C)



(D)



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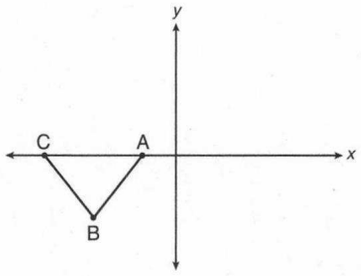
6. Which of the following is equivalent to $(6x^3 + 3x^2 - 1) + (4x^3 - 4x^2 + 2x + 3)$?

(A) $11x^6 + 2$
(B) $10x^3 - 7x^2 + 2x + 2$
(C) $10x^3 - x^2 + x + 3$
(D) $10x^3 - x^2 + 2x + 2$

7. Peter makes \$15 per hour when he works 40 hours a week. For each hour exceeding 40, he is paid 50% more than his usual hourly rate. Assuming that Peter has worked at least 40 hours in a particular week, which inequality properly expresses the range of hours, h, he must work to make over \$800 in that week?

(A) $800 < 600 + 22.5 \times (h - 40)$
(B) $800 < 600 + 22.5h$
(C) $800 < 600 + 7.5 \times (h - 40)$
(D) $800 < 40 + 15h$

8. In the xy-plane below, ABC is an equilateral triangle with sides of length 2. If point A has coordinates $(-2, 0)$, what are the coordinates of point B?



(A) $(-\sqrt{3}, -3)$
(B) $(-2, -\sqrt{3})$
(C) $(-3, \sqrt{2})$
(D) $(-3, -\sqrt{3})$

9. In a pet store with 30 customers, 60% of the customers like dogs and 11 customers like cats. What is the minimum number of customers who like both cats and dogs?

(A) 0
(B) 1
(C) 4
(D) 7

10. The function f is defined below. If $f(n)$ and n are both integers, what is the largest value that n can be?

$$f(n) = \frac{2}{\sqrt[4]{n - 300}}$$

(A) 0
(B) 301
(C) 316
(D) 426

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