Q1. Simplify the expression

$$\left(\frac{a^{-4}\cdot b^{-2}}{b^{6}}\right)^{2}\times\left(\frac{a^{3}\cdot b^{4}}{b^{-3}}\right)^{3}\times\left(\frac{b^{-2}}{a^{3}\cdot b^{-2}}\right)^{-1}$$

A. a^4b^5
B. $a^{-4}b^{-2}$
C. $a^{-3}b^4$
D. a^2b^3

Q2. If $p = 2^{3k-1}$ and $16p^2 = 2^{5k+2}$, find the value of k.

A. -1
B. 0
C. 1
D. 2

Q3. Find the value of x^2.

$$\sqrt[3]{x+6}-\sqrt[3]{x-6}=3.$$

A. $\frac{847}{27}$
B. $\frac{125}{27}$
C. $-\frac{1097}{27}$
D. $-\frac{367}{27}$

Q4. Two squares have sides (2x+1) cm and (x+9) cm respectively. The sum of their areas is 193 cm^2. Find the area of the larger square.

A. 49 cm^2
B. 81 cm^2
C. 144 cm^2
D. 196 cm^2

Q5. Find $\left(x^2+\frac{1}{x^2}\right)^2$ if x is a root of the equation $\left(x+\frac{1}{x}\right)^2-12\left(x+\frac{1}{x}\right)+36=0$.

A. 2356
B. 1156
C. 3146
D. 2146

Q6. A factory produces 80 gadgets on the first day and increases production by 40 gadgets each day. How many days will it take for the factory to produce a total of 3600 gadgets?

A. 12 days
B. 14 days
C. 15 days
D. 17 days

Q7. In an arithmetic sequence, the sum of the 3rd and 5th terms is 46, and the product of the 4th and 6th terms is 805. Find the 3rd term.

A. 14
B. 15

C. 16
D.17

Q8. A ball is dropped from a height of 200 cm. Each time it bounces, it reaches 60% of its previous height. What is the total distance traveled when it hits the ground for the fifth time?

A. 654.54
B. 722.24
C. 461.14
D. 514.74

Q9. Solve the equation

$$\log_{x-2}(x^2+4) = \log_{x-2}(3x+1).$$

A. -3
B. 3
C. 4
D. no solution

Q10. In a contest, 5 men and 8 women participate. Two winners are selected at random without replacement. What is the probability that at least one of the winners is a man?

A. $\frac{14}{39}$
B. $\frac{25}{39}$
C. $\frac{11}{39}$
D. 1

Q11. A coin is tossed and a die is rolled. Find the probability that the coin shows tails **or** the die shows an odd number.

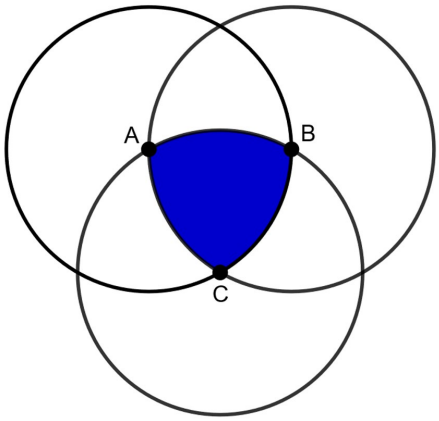
A. $\frac{3}{4}$
B. $\frac{1}{3}$
C. $\frac{2}{3}$
D. $\frac{1}{2}$

Q12. The roots of the equation $x^2 - 4x + p = 0$ are also the roots of the equation $x^3 + qx + 16 = 0$.

Find $p + q$.

A. -8
B. -6
C. -4
D. -1

Q13. In the figure below, three identical circles with a diameter of 20 centimeters and centers A, B, and C are arranged so that each circle passes through the center of the other two. What is the area of the blue region in square centimeters? Consider $\pi = 3$ and $\sqrt{3} = 1.7$.



A. 65
B. 130
C. 195
D. 260

Q14. The diagonals of a parallelogram are 25 cm and 20 cm long and meet at an angle of 150°. Find the area of the parallelogram.

A. 125
B. $25\sqrt{5}$
C. $125\sqrt{2}$
D. $250\sqrt{2}$

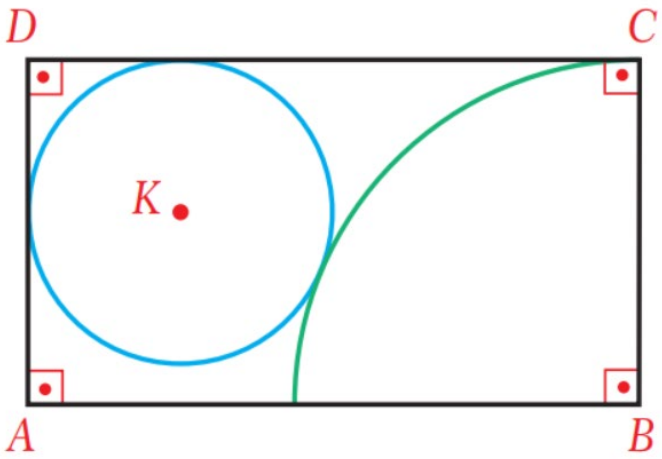
Q15. Cody climbs a 7-step ladder by taking 1, 2, or 3 steps at a time. How many different ways can he reach the top?

A. 274
B. 134
C. 81
D. 44

Q16. Solve $sin^4x + cos^4x = \frac{1}{2}$.

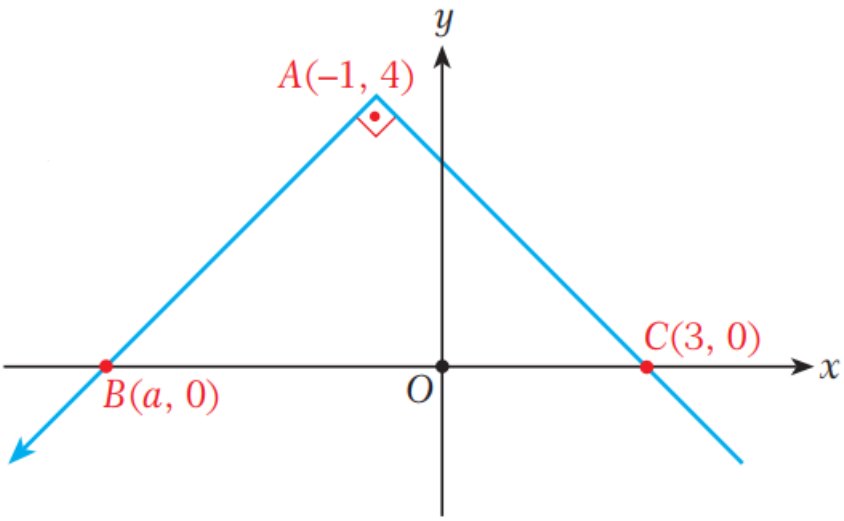
(answer: $x = \frac{\pi}{4} + \pi k \; or \; x = \frac{3\pi}{4} + \pi k \; , k \epsilon Z$)

Q17. In the figure, ABCD is a rectangle, $AB = 8\,cm$ and the circle and quarter circle are tangent. If the radius of the smaller circle is 2 cm, what is the radius of $\odot B$?



(Answer: 4.5 cm)

Q18. In the figure, find the value of a.



(Answer: -5)

Q19. Solve the system equation

$$\begin{cases} \dfrac{1}{x} - \dfrac{1}{y} = \dfrac{3}{20} \\ \log_5 x + \log_5 y = 2 + \log_5 4 \end{cases}$$

(Answer: (5,20))

Q20. If $g(x) + 4 \cdot g\left(\frac{1}{x}\right) = x + \frac{1}{x}$, find $g(x)$ in terms of x.

(Answer: $g(x) = \frac{x^2+1}{5x}$)