Practice Exam 1: Math 2-to-3B Place-Up Pathway Exam

Instructions

The Math 2-to-3B PUP-E has 23 questions and lasts 45 minutes. You must get 16 or more correct to pass. The exam is closed notes, no cheat sheets, and no calculator. **Time yourself** and take this practice exam under these conditions. Expect a range of difficulty levels, including both calculations and word problems. Do not work this exam until you have fully completed your review. Answers follow below. Detailed solutions are intentionally not provided; this will force you to discover the source of your errors.

Problems

1. Find $\dfrac{2y - x^3}{4}$ when $x = -2$ and $y = 3$

2. Find $1.6 \cdot 5.4$

3. Solve $\dfrac{4y + 1}{2y - 3} = \dfrac{5}{3}$

4. Find $\dfrac{d^{13}d^4}{d^6}$

5. Find $\sqrt{32} \cdot \sqrt{18} \cdot \sqrt{48}$

6. Expand $\left(\dfrac{t}{4} - 8\right)^2$

7. Find $\dfrac{3}{10} \cdot \dfrac{4}{7} + \dfrac{2}{5}$

8. Solve $4.2 - 1.7(w + 1) = \dfrac{5 - 3.4w}{2}$

9. Suppose you are designing a rectangular logo for a company. The company likes a look where the length is 15% more than the height, and they want to keep the total perimeter below 86 inches. What heights are possible?

10. Find $(4 + 10\sqrt{3}) - (5 + 6\sqrt{3})$

11. Expand $(y - y^2)(4y^3 + 2y^2)$

12. Suppose you label all the people in your life as either "family", "close friends", or "acquaintances". If $\frac{3}{7}$ of people are family and $\frac{1}{3}$ are close friends, what fraction are acquaintances?

13. Suppose that the side length of a square is decreased by 10%. By what percent will this decrease the area?

14. Solve $-4 < \frac{3x - 7}{5} < 4$ and give your answer in interval notation.

15. Find $\sqrt[3]{1} + \sqrt[4]{1} + \cdots + \sqrt[30]{1} + \sqrt[31]{1}$

16. A farmer buys a circular piece of farmland that is advertised as 50π square miles. If a house is built at the center of the property, how far is it from the house to the edge of the property?

17. Factor $4a^2b^3 - 400b^3$

18. The length of a rectangle is the GCD of 21 and 15. The width is the LCM of 21 and 15. Find the perimeter of the rectangle.

19. Solve the equation $\frac{x}{3} + \frac{3x - 1}{4} = \frac{x + 1}{2}$.

20. You're trying to decide between two cell phone plans. Google Fi's Flexible Plan charges \$20 per month for talk/text and then \$10 per gig of data you use. Verizon's Unlimited Welcome Plan is just a flat rate of \$85 for unlimited talk/text/data. For what range of data usages is the Google Fi Flexible Plan a cheaper option?

21. Recently, scientists were able to build a square-shaped semiconductor with side length 3 nanometers (i.e., $3 \cdot 10^{-9}$ m). How many of these chips fit on a square-shaped circuit board with side 9 centimeters?

22. The human eye can't see a single bacterium. Over time, though, the bacterium splits and resplits, growing exponentially. Typically, the human eye can detect bacterial growth once the colony reaches about 2^{25} cells (this is between 10 and 100 million!). For a given type of bacterium, the number of bacteria after t hours is given by $1 \cdot 2^{4t}$. How long will it take for the human eye to see the growth from this bacterium? Give your answer as a decimal.

23. How much wood is wasted when a circular radioactive sign of radius r is cut from a square starting shape? Write your answer as a monomial using the variable r.

Answers

1. $\frac{7}{2}$
2. 8.64
3. $y = -9$
4. d^{11}
5. $96\sqrt{3}$
6. $\frac{t^2}{16} - 4t + 64$
7. $\frac{4}{7}$
8. All real numbers
9. $h < 20$
10. $-1 + 4\sqrt{3}$
11. $-4y^5 + 2y^4 + 2y^3$
12. $\frac{5}{21}$
13. 19%
14. $\left(\frac{-13}{3}, 9\right)$
15. 29
16. $5\sqrt{2}$
17. $4b^3(a - 10)(a + 10)$
18. 216
19. $x = \frac{9}{7}$

20. $0 \leq x < 6.5$, where x is the number of gigs of data you use

21. $9 \cdot 10^{14}$ chips

22. 6.25 hours

23. $(4 - \pi)r^2$