

Math 1102, Math 1113 and Math 2500
Placement Test
Information, Sample Questions and Solutions

This document describes the prerequisites for Math 1102 (Precalculus), Math 1113 (Introduction to Calculus) and Math 2500 (Statistical Modeling and Data Analysis), as well as providing practice problems for the placement test for these courses.

Prerequisites

1. **Math 0027 – Statistics and Mathematics Preparation**

No prerequisite.

2. **Math 1102 – Precalculus I**

Grade 11 and Grade 12 Mathematics.

AND **one** of the following:

- Mathematics Placement Test with placement into Math 1102.
- Math 0027 within the last three years and achieved a grade of C or higher.

3. **Math 1113 – Introduction to Calculus I**

High school precalculus or Math 1103 (second half of 1102)

AND Mathematics Placement Test with placement into Math 1113.

4. **Math 2500 - Statistical Modeling and Data Analysis**

Mathematics Placement Test or Math 1102 with a grade of C– or higher.

The following are the mathematical concepts needed prior to taking Math 1102, Math 1113 and Math 2500. Practice problems with solutions are provided.

1. Prerequisite Topics for Math 1102 – Precalculus I

- Polynomial expressions
- Linear equations of a single variable
- Equations of lines
- Systems of equations with two variables
- Factorization
- Quadratic expressions
- Rational expressions
- Square roots.

**2. Prerequisite Topics for Math 1113 – Introduction to Calculus I and
Math 2500 - Statistical Modeling and Data Analysis**

- All mathematics prerequisites for Math 1102
- Quadratic functions
- Polynomial functions
- Exponents and radicals
- Exponential and logarithmic functions, including natural log
- Trigonometry, including the unit circle.

Practice Problems for Math 1102 Placement Test

1. Evaluate $4x^2y - 3xy^2$ where $x = -2$, $y = 3$.
2. Simplify $(5ab - 4b) - (3ab + 2a - 6b)$.
3. Multiply $(6x - 2)(x^2 - 3x + 5)$.
4. Solve $4(3x + 5) = -5(x + 13)$ for x .
5. Jo has 23 coins. She has *twice as many* nickels as pennies and *three more* dimes than pennies. How many of each type of coin does she have?
6. Solve $9x - 7(x + 200) = 6600$.
7. The length of a rectangle is *two centimetres more than twice its width*. The perimeter is 34 centimetres. Find the dimensions of the sides of the rectangle.
8. Solve $3 - 2x < x + 9$ for x .
9. Graph $4x - 5y = 10$.
10. Find the slope of the line passing through the points $(-5, 2)$ and $(6, -1)$.
11. Find the equation of the line passing through the points $(2, -1)$ and $(4, 6)$. Write it in standard form: $ax + by = c$.
12. Give the equation (in standard form) of the line that has a slope of $5/6$ and a y -intercept of 4.
13. Graphically solve for x and y , given $x - y = 8$ and $3x + 2y = 9$.
14. Solve for x and y using elimination, given $5x + 3y = 10$ and $6x + 4y = 15$.
15. Solve for x and y using substitution, given $6x - y = 9$ and $y = 3x - 7$.
16. Alice spent 6 minutes on each factoring problem and 3 minutes on each evaluation problem. She spent a total of 42 minutes on 9 problems. How much time did she spend on factoring problems?
17. Factor $15a^2b^3c - 45ab^3c^2 + 9b^4c^3$.
18. Factor $6x^2 - 12x + xy - 2y$.
19. Factor $a^2b^6 - 49c^4$.

20. Factor $27s^3 - t^6$.
21. Factor $t^2 - 10t + 24$.
22. Factor $2x^2 + x - 10$.
23. Factor $x^4 + 3x^2 - 18$.
24. Factor $36x^3 + 6x^2 - 12x$.
25. Solve by factoring: $2x^2 - 31x = 16$.
26. One side of a right-angle triangle is 4 cm *less than the hypotenuse* and the other is 2 cm *less than the hypotenuse*. Find the length of all sides.
27. Solve using the quadratic formula: $2(x^2 - 3x) = 5$.
28. Simplify $\frac{84x^3y^4}{108xy}$.
29. Simplify $\frac{(2x - 2x^2)}{(x^2 - 1)}$.
30. Simplify $\frac{7}{(x^2 - 6x)} - \frac{3}{(x^2 + 2x)}$.
31. Simplify $\frac{(3x^2 + 10x - 8)}{(5x^2 + 19x - 4)} - \frac{(3x^2 - 23x + 14)}{(x^2 - 3x - 28)}$.
32. Evaluate $\sqrt{81}$.
33. Evaluate $\sqrt{64/4}$.
34. Evaluate $\sqrt{50a^6b^{10}}$ where $a, b \geq 0$.

Solutions

1. 102
2. $2ab + 2b - 2a$
3. $3x^3 - 20x^2 + 36x - 10$
4. $x = -5$
5. 5 pennies, 10 nickels, 8 dimes
6. $x = 4000$
7. Width is 5 cm; Length is 12 cm.
8. $x > -2$ or $x \in (-2, \infty)$
9. Straight line with slope of $4/5$, intercepts at $(0, -2)$ and $(5/2, 0)$
10. $-3/11$
11. $7x - 2y = 16$
12. $-5x + 6y = 24$
13. $(5, -3)$
14. $(-5/2, 15/2)$
15. $(2/3, -5)$
16. 30 minutes
17. $3b^3c(5a^2 - 15ac + 3bc^2)$
18. $(x - 2)(6x + y)$
19. $(ab^3 - 7c^2)(ab^3 + 7c^2)$
20. $(3s - t^2)(9s^2 + 3st^2 + t^4)$
21. $(t - 6)(t - 4)$
22. $(2x + 5)(x - 2)$
23. $(x^2 - 3)(x^2 + 6)$
24. $6x(3x + 2)(2x - 1)$
25. $x = -\frac{1}{2}, x = 16$
26. 6 cm, 8 cm, 10 cm
27. $\frac{3 - \sqrt{19}}{2}, \frac{3 + \sqrt{19}}{2}$
28. $\frac{7x^2y^3}{9}$
29. $-\frac{2x}{x+1}$
30. $\frac{4(x+8)}{x(x-6)(x+2)}$
31. $\frac{(3x-2)(5-4x)}{(5x-1)(x+4)}$
32. 9
33. 4
34. $5\sqrt{2}a^3b^5$

Practice Problems for Math 1113 Placement Test

1. If $f(x) = 3x^2 + 8$, find $f(-2)$.
2. If $f(x) = 3x^2 + 8$, find $\frac{f(a+h) - f(a)}{h}$.
3. If $f(x) = \sqrt{3x-1}$, find the domain of $f(x)$.
4. For children between ages of 6 and 10, the height, h , (in cm) is a linear function of age, t , in years. A child aged 6 is 122 cm tall and a child aged 7 is 128 cm. Express the height, h , as a function of t .
5. Let $f(x) = 3x$ and $g(x) = 2x^2 - 5x$. Find $(f \circ g)(x)$.
6. For $f(x) = 3x + 5$, find the inverse function $f^{-1}(x)$.
7. If $f(x) = \begin{cases} x+4 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$ find $f(-2)$.
8. For $f(x) = |2x + 7| - 4$, solve $f(x) = 11$ for x .
9. Solve $x^2 - x \geq 12$ for x .
10. Find the domain of $f(x) = \sqrt{x^2 + 3x + 2}$.
11. Solve $(x-1)^2(x+3) > 0$ for x .
12. Factor $x^3 + x^2 - 5x + 3$
13. Solve $\frac{2x+1}{x-3} \geq 1$ for x .
14. Simplify $(5x^2y^{-3})(4x^{-5}y^4)$ as much as possible.
15. Simplify $(27a^6)^{-2/3}$ as much as possible.

16. Rationalize the denominator of $\frac{\sqrt{t} + 5}{\sqrt{t} - 5}$.
17. Solve $\sqrt{x^2 + 9} - 1 = x$.
18. Solve $4^{(x-3)} = 8^{(4-x)}$ for x .
19. Evaluate $\log_5(25)$.
20. Evaluate $\log_2(\sqrt{8})$.
21. Evaluate $\ln(e^{-3})$.
22. Solve $10^x = 25$ for x .
23. Solve $\log_9(x) = \frac{1}{2}$ for x .
24. Solve $\log_x(36) = 2$ for x .
25. When a certain drug is taken orally, the amount A in milligrams in the bloodstream after t hours is predicted to be $A = 100(1 - 3t/8)$ for $0 \leq t \leq 2.5$. How much of the drug is predicted to be present in the bloodstream after 2 hours?
26. Solve $\log_2(x) + \log_2(x + 2) = 3$ for x .
27. Find the radian measure of -45° .
28. Find the sine, cosine, and tangent of $\frac{3\pi}{2}$ radians.
29. A right-angle triangle has an angle, θ , a hypotenuse of length 7 cm and the side opposite the angle has a length of 4 cm. Find the sine and cosine of θ .
30. Find the exact value of $\sin(2\pi/3)$.
31. Find the exact value of $\cos(-5\pi/4)$.
32. Find the exact value of all angles θ in the interval $[0, 2\pi]$ that satisfy the equation $\sin \theta = -1/2$.

Solutions

1. 20

2. $6a + 3h$

3. $x \geq 1/3$ or $[1/3, \infty)$

4. $h = 6t + 86$

5. $f(g(x)) = 6x^2 - 15x$

6. $f^{-1}(x) = \frac{x-5}{3}$

7. $f(-2) = 2$

8. $x = 4$ or $x = -11$

9. $(-\infty, -3] \cup [4, \infty)$

10. $(-\infty, -2] \cup [-1, \infty)$

11. $(-3, 1) \cup (1, \infty)$

12. $(x-1)^2(x+3)$

13. $(-\infty, -1/2] \cup (3, \infty)$

14. $\frac{20y}{x^3}$

15. $\frac{1}{9a^4}$

16. $\frac{t+10\sqrt{t}+25}{t-25}$

17. 4

18. $x = \frac{18}{5}$

19. 2

20. $\frac{3}{2}$

21. -3

22. $\log(25)$

23. 3

24. 6

25. 25 milligrams

26. 2

27. $-\frac{\pi}{4}$

28. $\sin(3\pi/2) = -1$, $\cos(3\pi/2) = 0$

$\tan(3\pi/2)$ does not exist.

29. $\sin \theta = 4/7$, $\cos \theta = \sqrt{33}/7$

30. $\frac{\sqrt{3}}{2}$

31. $-\frac{\sqrt{2}}{2}$

32. $\frac{7\pi}{6}$, $\frac{11\pi}{6}$