Math 1102 and Math 1113 Placement Test

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This document describes the prerequisites for Math 1102 (Precalculus) and Math 1113 (Introduction to Calculus), as well as provide practice problems for the placement test for these courses.

<u>Prerequisites</u>

1. **Math 0200 - College Algebra**

   (a) No prerequisite

2. **Math 1102 - Precalculus**

   (a) Grade 11 and Grade 12 Mathematics
   (b) One of following:
       i. Mathematics Placement Test with placement into Math 1102
       ii. Taken Math 0020 within the last three years and achieved a grade of C or higher.

3. **Math 1113 - Introduction to Calculus**

   (a) High school precalculus or Math 1103 (second half of 1102)
   (b) Mathematics Placement Test with placement into Math 1113

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

1. Math 1102 - Precalculus Mathematics Prerequisites

   - 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. Math 1113 - Introduction of Calculus Mathematics Prerequisites

   - 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 $4(3x + 5) = -5(x + 13)$

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 centimetre more than twice its width. The perimeter is 34 centimetres. Find the dimension of the rectangle.

8. Solve $3 - 2x < x + 9$

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 $(4, 6)$. Put it in standard form, $ax + by = c$

12. Give the equation (in standard form) of the line with slope $5/6$ and y-intercept 4.

13. Solve for x and y by graphing, 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 teach 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 4cm less than the hypotenuse and the other is 2cm 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 $\sqrt{\frac{64}{4}}$

34. Simplify $\sqrt{50a^6b^{10}}$ where $a, b \geq 0$

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Solutions

1. 102

2. $2ab + 2b - 2a$

3. $6x^3 - 20x^2 + 36x - 10$

4. $x = -5$

5. 5 pennies, 10 nickles, 8 dimes

6. $x = 4000$

7. 12cm by 5cm

8. $x > 2$ or $x \in (-2, \infty)$

9. 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. $x = -1/2, x = 16$

26. 6cm, 8cm, 10cm

27. $\frac{3 - \sqrt{19}}{2}, \frac{3 + \sqrt{19}}{2}$

28. $7x^2/9y$

29. $-2x/(x + 1)$

30. $\frac{4(x+8)}{x(x-6)(x+2)}$

31. $\frac{x+4}{5x-1}$

32. 9

33. 4

34. $5\sqrt{2}a^3b^5$

Practice Problems for Math 1113 Placement Test

1. Let $f(x) = 3x^2 + 8$. Find $f(-2)$

2. Let $f(x) = 3x^2 + 8$. Find $\frac{f(a+h)-f(a)}{h}$

3. Let $f(x) = \sqrt{3x-1}$. Find the domain.

4. For children between the ages of 6 and 10, the height (in cm) is a linear function of age, t, in years. A child age 6 is 122cm tall and a child age 7 is 128cm. Express the height has a function of t.

5. Let $f(x) = 3$ and $g(x) = 2x^2 - 5x$. Find $(f \circ g)(x)$.

6. For $f(x) = 3x + 5$, find the inverse $f^{-1}(x)$.

7. Let

$$f(x) \begin{cases} x+4 & x \le -1 \\ x^2 & x > -1 \end{cases}$$

Find $f(-2)$.

8. For $f(x) = |2x + 7| - 4$ solve $f(x) = 11$

9. Solve $x^2 - x \ge 12$

10. Find the domain of $f(x) = \sqrt{x^2 - 3x + 2}$

11. Solve $(x - 1)^2(x + 3) > 0$

12. Factor $x^3 + x^2 - 5x + 3$

13. Solve $\frac{2x+1}{x-3} \ge 0$

14. Simplify $(5x^2y^{-3})(4x^{-5}y^4)$

15. Simplify $(27a^6)^{-2/3}$

16. Rationalize the denominator of $\frac{\sqrt{t}+5}{\sqrt{t}-5}$

17. Solve $\sqrt{x^2 + 9} - 1 = x$

18. Solve $4^{x-3} = 8^{4-x}$

19. Evaluate $\log_5 25$

20. Evaluate $\log_2(\sqrt{8})$

21. Evaluate $\ln(e^{-3})$

22. Solve $10^x = 25$

23. Solve $\log_9(x) = \frac{1}{2}$

24. Solve $\log_x(36) = 2$

25. When a certain drug is taken orally, the amount A in milligrams present in the bloodstream after t hours is predicted to be $A = 100(1 - \frac{3x}{8})$ for $0 \le t \le 2.5$. How much of the drug is predicted to be present in the bloodstream after 2 hours?

26. Solve $\log_2(x) + \log_2(x + 2) = 3$

27. Find the radian measure of $-45°$

28. Find the sine, cosine and tangent of $\frac{3\pi}{2}$

29. A right angle triangle has an angle, θ a hypotenuse of 7 and the side opposite the angle has a value of 4. Find the sine and cosine of θ.

30. Find the exact value of $\sin(\frac{2\pi}{3})$

31. Find the exact value of $\cos(\frac{-5\pi}{4})$

32. Find the exact value of all angles θ in the interval $[0, 2\pi]$ that satisfy the equation $\sin(\theta) = \frac{-1}{2}$.

Solutions

1. 20

2. $6a + 3h$

3. $[1/3, \infty)$

4. $y = 6t + 86$

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

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

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

13. $(-\infty, -\frac{1}{2}] \cup (3, \infty)$

14. $20y/x^3$

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

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

17. 4

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

19. 2

20. $3/2$

21. -3

22. $\log(25)$

23. 3

24. 6

25. 25 milligrams

26. 2

27. $-\pi/4$

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