Add these fractions:

\[
\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}
\]

Here are some representative questions:

- The laws of logarithms
- The geometry of a right triangle
- The slope of a straight line
- The equation of a straight line
- Adding fractions
- Simplifying fractions
- Radicals
- Rational exponents
- Word problems
- Inequalities
- Simultaneous equations
- Absolute value equations
- Quadratic equations
- Literal equations

From the following topics:
The examination to be exam from MAT 056 will consist of twenty questions, which will be drawn

SAMPLE PROBLEMS: EXAMINATION FROM MAT 056

Mathematics Department

Borough of Manhattan Community College
Use the following:

In the right triangle below, angle $\theta = 36^\circ$, and side $b = 10$ cm. Find side $a$.

\[
\frac{a}{c} = \frac{q - c}{c}, \quad \frac{q - c}{c}, \quad \frac{q - c}{c} = \frac{c - q}{q - c}
\]
17. Simplify the following. Express your answer using only positive exponents:
\[
\left( \frac{c}{b} \cdot \frac{d}{e} \right) \left( \frac{b}{d} \cdot \frac{e}{c} \right)
\]

16. Solve for \( x \): \( 15x^2 + 11x - 6 = 0 \)

15. Express the following as a single fraction in simplified form:
\[
\frac{p + q}{l - \frac{1}{q^n}}
\]

14. Express the following as a single fraction in simplified form:
\[
\frac{3 + x}{2 - x} - \frac{1}{1 + 1}
\]

13. Multiply the complex numbers and then write the answer in standard form:
\[
(4 + 2i)(5-3i)
\]

12. Subtract the following complex numbers. Then, write the answer in standard form:
\[
8 \frac{z}{x} + \frac{z}{x} = (t - j)(2 - (4 + z - x))
\]

11. Write the slope of the line expressed by the equation:
\[
\frac{y}{x} = 2
\]

10. Write the equation of the line that passes through the point \((3, -1)\) and is parallel to the line \(y = 2x + 1\):

9. What is the equation of the line that passes through the point \((1, 1)\) and is perpendicular to the line \(y = 3x + 2\):

8. Find the \( x \) and \( y \) intercepts of the line \( y = 4x - 3\), then graph:
\[
\{ x - y = 3 \}
\]

7. Write down a quadratic equation that has roots:
\[
x = \frac{5}{2}
\]

6. Solve the following equation, be sure to check the solutions:
\[
\frac{s + x}{t} = \frac{s - x}{t} - \frac{s - x}{t}
\]

5. Solve the following absolute value inequality and graph your solution set:
\[
| 2x + 5 | \leq 7
\]

4. Solve the following absolute value inequality:
\[
\frac{x}{2} \leq 1 + \left( 5 + 6x \right)^\frac{4}{9}
\]

3. Solve for \( x \):
\[
5ax + 3d = 5 x - 3 (4x + 2) - 1
\]

2. Solve for \( p \):
\[
p = 7x - 5x^2 - 3 (4x + 2) - 1
\]

1. Simplify:
\[
x = \frac{5}{2}
\]

Sample test.

Study the range of topics described on the syllabus as well as the types of problems on this form.

Practice Problems for the MAT 056 Departmental Final

Department of Mathematics
Borough of Manhattan Community College
2. Find the exact value of \( \tan 150° \).

3. Write the expression \( \frac{\log_{8} x - \log_{8} y + 2 \log_{8} z}{\log_{8} 3} \) as a single logarithm.

4. Rationalize the denominator in the expression \( \frac{\sqrt{2} \cdot \sqrt{x}}{\sqrt{3} + \sqrt{x}} \).

5. Express \( x = 0 + \sqrt{3} \) as an equivalent fraction with a rational denominator in simplified form.

6. Solve for \( x \):

7. Simplify the following completely:

8. does he have?

9. Solve the system of equations:

10. Solve the inequality \(-4 \leq d \leq 2\).

11. Graph solution on the number line.
24. \( \sqrt{2} + 3 + \sqrt{2} + 2\sqrt{3} + 3 + 6 \sqrt{3} 

23. \frac{\sqrt{2}}{3} + \frac{3}{1} 

22. \( x = \frac{-2}{15} \)

21. 16 

20. 12 dimes and 13 nickels 

19. No solution 

18. \( a < 1 \) \( a \frac{2}{b+1} \frac{6}{d} \)

17. \( 1 \) \( 30 \) \( \sqrt{18} + 1 \) \( \sqrt{11} - \frac{\sqrt{4}}{1} + \sqrt{5} \)

16. \( \sqrt{12} \) \( \sqrt{15} \) \( \sqrt{14} \)

15. \( z \) \( \frac{2x}{z} \) \( \frac{z}{2} \frac{2}{x} \)

14. 13 = 12 

13. \( \frac{z}{x} = \frac{w}{1} \)

12. \( z = 10 \)

11. \( \frac{2x - 16}{2} \) \( \frac{2x}{z} \) \( \frac{z}{x} = \frac{w}{1} \)

10. \( \frac{5x}{z} \) \( \frac{5x - x}{z} = \frac{w}{1} \)

9. Each line above represents a single unit.

8. \( x \)-intercept is 6, \( y \)-intercept is \(-7 \)

7. Any multiple of \( \frac{2}{5} \)

6. \( x = \frac{5}{z} \) \( \frac{5}{z} = \frac{5}{z} \)

5. No solution 

4. \( a \leq x < 1 \) \( \frac{11}{6} = \frac{x}{5} \) \( \frac{5}{z} = \frac{5}{z} \)

3. 2

2. \( d = \frac{2x}{z} \frac{2}{x} \) \( \frac{2x}{z} \) \( \frac{2}{z} \frac{2}{z} \frac{2}{z} \frac{2}{z} \frac{2}{z} \)

1. \( \frac{4x + 35}{35} \)

ANSWER KEY FOR MAT 056 Practice Final Exam Form P
Optional for 05G students

15. The perimeter of a rectangle is to be between 180 inches and 200 inches.

What is the range of values for its length?

16. The perimeter of a square is to be between 20 meters and 60 meters. What are the possible measures of the longer angle?

17. The perimeter of a square is not less than 300 more than twice the other angle.

What is the range of values for its length if the width is to be 40 inches?

18. Express the double inequality \(-3 \leq x \leq 7\) as an absolute value inequality:

\[ |x - 3| < 2 \]

19. Solve the absolute value equations below and graph each:

\[ \frac{x - 2}{3} < 0 \]

\[ \frac{x + 2}{4} \geq 0 \]

10. Solve the quadratic inequalities and graph the solution set:

\[ 5x^2 + 2x + 6 > 0 \]

\[ 3x - 7 \geq 0 \]

11. Solve each double inequality and graph the solution set:

\[ -3x + 2 < x \geq 1 \]

\[ 2x - 7 > 0 \]

\[ x - 7 \geq 3 \]

\[ 3x - 7 \geq 2 \]

\[ 3x - 7 \leq 2 \]

Inequalities and Absolute Value Equations
14. \( x - \frac{2}{3} \geq 1 \)
13. \( \frac{z}{3} - \frac{3}{6} \geq 1 \)
12. \( x = -3 \)
11. \( x \in \mathbb{Z}^+ \)
10. \( -5 < x < 9 \)
9. \( x \in \mathbb{R} \)
8. \( x \in \mathbb{Z} \)
7. \( x \in \mathbb{Q} \)
6. \( -3 < x < 1 \)
5. \( x \in (2, \infty) \)
4. \( 1 < x < 4 \)
3. \( x < 3 \)
2. \( x < \frac{5}{2} \)
1. \( x > 3 \)

Answers:
The sum of two cubes

\[ \frac{a^3 + b^3}{x^3 + y^3} = 8 \]

The difference of two cubes

\[ \frac{a^3 - b^3}{x^3 - y^3} = 2 \]

The difference of two squares

\[ \frac{a^2 - b^2}{x^2 - y^2} = 2 \]

Perfected square trinomials

\[ \frac{a^2 + 2ab + b^2}{x^2 + 2xy + y^2} = 2 \]

Remember

10. Factor completely

(8) \(6x^2 - 256y^2\)

(8) \(12x^2 + 343\)

(8) \(6x^2 - 64\)

6. Factor as the difference of two cubes. Solve if possible.

\[ b) 125x^3 - 64 = 0\]

\[ b) 25y^2 - 144\]

\[ b) 6x^2 - 121\]

5. Factor each trinomial

\[ b) 3x^2 - 32x^6 - 3x^4\]

\[ b) 15x^3 + 15 - 6ax^3\]

4. Factor using GCF and solve

\[ b) x^3 - 4x + 4\]

\[ b) 3x^3 + 14x^2 - x\]

3. Simplify by combining the like terms and operations

\[ \frac{2x^2 + 4x^2 - x + 2y^2}{2x^2 + 12y^2} = \frac{2x^2 + 4x^2 - x + 2y^2}{2x^2 + 12y^2} \]

2. Simplify each expression, if possible.

1. Simplify and express each answer using positive exponents only.

Exponents and Polynomials Review Sheet

Mathematics Department Math 056

Borough of Manhattan Community College
(2y - 3x)(2x + 3y)(q)

10. \( q = \alpha + 10y \)

\( \frac{z}{q} = x : \text{only one real solution:} \quad 0 = (2x + 7y)(q) \)

\( \frac{z}{q} = x : \text{only one real solution:} \quad 0 = (5x + 16 + 20x + 25y^2 - 4x^2)(q) \)

8. \( \alpha = 5x - y \)

\( \alpha = 5x - y \)

7. \( \alpha = 3x, y \)

6. \( \alpha = 4x + 4y^2 \)

5. \( \alpha = 3y - x \)

4. \( \alpha = 3y - x \)

3. \( \alpha = 3y - x \)

2. \( \alpha = 3y - x \)

1. \( \alpha = 3y - x \)

Answers
1. Find the number.

\[ \frac{3}{x} = \frac{1}{2} \]

2. If a certain number is added to the numerator and denominator of \( \frac{3}{5} \), the result is \( \frac{10}{7} \). Find the number.

3. Solve the equation \( \frac{x}{5} = \frac{1}{4} \).

4. The value of the largest number is \( \frac{3}{2} \). One number is twice another. The sum of their reciprocals is \( \frac{5}{6} \).

5. The rate of a motorcycle is 40 mph greater than the rate of a bicycle. The motorcycle travels 150 mi in the same amount of time as the bicycle travels 30 mi. Find the rate of the motorcycle.

6. A canoeist can paddle at a rate of 8 mph in still water. Traveling with the current, the canoe traveled 30 mi in the same amount of time as it traveled 180 mi against the current. Find the rate of the current.

7. A jet can fly 550 mph in calm air. Traveling with the wind, the plane can fly 2250 mi in the same amount of time as it flies 1800 mi against the wind. Find the rate of the wind.

8. One water pipe can fill a tank in 90 min while a second pipe can fill the tank in 60 min. How long would it take to fill the tank if both pipes were used?

9. A man can construct a well in 20 hrs. With the help of his apprentice assistant, the task would take 12 hrs. How long would it take the apprentice, working alone, to construct the well?

10. The apprentice assistant would take 12 hrs. How long would it take the apprentice, working alone, to construct the well?


Mathematics Department Math 055 Topic #4

Borough of Manhattan Community College (AMPS)
1. The formula $p = \frac{a}{1} + \frac{b}{1}$ is used by optometrists to help determine how strong to make the lenses for a pair of eyeglasses. If $a = 10$ and $b = 0.2$, the corresponding value of $p$ is:

\[ (a) 5/1 \quad (b) 10.2 \]  
(c) 6/1

10. Two people working together can do a job in 3 hrs. How long will it take the slower person to do the same job if one of them is 3 times as fast as the other?

9. Two people working together can do a job in 3 hrs. How long will

\[ \text{(a) } \frac{g}{h} \quad \text{(b) } \frac{10}{2} \quad \text{(c) } \frac{g}{h} \quad \text{(d) } \frac{6}{1} \quad \text{(e) } \frac{110}{2} \quad \text{(f) } \frac{3}{13} \]
15. Solve for $x$: $x^2 + 27 = 0$

14. Solve and graph the solution set for $x$: $9 \geq x^2$

13. Solve for $x$: $(x-1)^2 + 2(x-1) - 35 = 0$

12. Solve for $x$: $x - 8 \sqrt{x} + 12 = 0$. (Show all solutions.)

11. Solve for $x$: $x^4 - 6x^2 - 27 = 0$. (Show all solutions.)

10. Find an equation that has $x = 2$ and $x = \frac{2}{3}$ as solutions.

9. Find $a$ so that $3x^2 - 12x = ax - 12$ has one rational solution.

(b) Solve for $x$: $9 - 12x = -4x^2$

8. Use the discriminant to identify the number and kind of solutions to:

7. Solve by completing the square: $2y^2 - 6y + 4 = 0$

6. Solve by any method: $\frac{x^2 + 4}{2} = \frac{x - 2}{2a}$

5. Solve by completing the square: $(x + 5)(x - 3) = -25$

4. Solve by the quadratic formula: $2x^2 + 3 = -2x$

3. Solve for $x$: $x^2 - 8 = 0$

2. Solve for $a$: $(2a - 3)^2 = -16$

1. Solve by the quadratic formula: $3x^2 = x + 4$

Solving Quadratic and Cubic Equations. Practice Sheet
Answers Topic #7

1. \(-1, 3/4\)

2. \(2 \pm 2i\)

3. \(2 - \frac{1}{3i}\)

4. \(\frac{2}{\sqrt{5}} - i\sqrt{3}\)

5. \(1 + \frac{1}{3i}\)

6. \(-1 \pm i\sqrt{3}\)

7. \(1/2\)

8. \((a) \text{ One Rational Solution}\)

9. \(\frac{2}{3}\)

10. \(2x^2 - 5x - 3 = 0\)

11. \(-3, 3, -\frac{1}{3}\)

12. 4, 36

13. -6, 6

14. \(-3 < x < 3\)

15. \(-3, -\frac{2}{3}\)
\[
0 = g - x/y + \log y - x/ \log y (d) \\
0 = g - x \log y (e)
\]

1 = (1 - x) \log y + x \log y (f) \\
1 = 3 \log y (g)

Solve each of the following equations:

\( z^{0.1} \log y - \lambda^{0.1} \log y - \lambda^{0.1} \log y = (d) \)

\( z^{0.1} \log y - \lambda^{0.1} \log y = (e) \)

Write each expression as a single logarithm:

\( \text{measurable on a seismograph?} \)

\( \text{many times greater is its shockwave than the smallest shockwave} \)

Write each expression as a single logarithm:

\( \text{if an earthquake has a magnitude of 8 on the Richter Scale, how} \)

Find the pH of a bottle of vinegar, if the concentration of the

Simplex each of the following:

\( x = 5 \log x - 6 \log x = (d) \)

\( x = 5 \log x = (c) \)

Solve each expression for \( x \)

\( x = 5 ^{2/3} \log x = (a) \)

\( x = 10 ^{0.3} \log x = (b) \)

\( x = 10 ^{0.3} \log x = (b) \)

\( x = 10 ^{0.3} \log x = (b) \)

Write each expression in exponential form:

\( 10 ^{0.3} x = 1010.3 \cdot 6 \) (d)

1. Write each of the following expressions in logarithmic (log) form:

2. Write each expression in exponential form:

3. Solve each expression for \( x \)

4. Simplify each of the following:

5. Find the pH of a bottle of vinegar, if the concentration of the

6. If an earthquake has a magnitude of 8 on the Richter Scale, how
5. $651.56

$10 \times 0.967

5.369

\log_{10}(p) \quad \log_{10}(q)

\frac{z}{y} \times \frac{\log_{10}(c)}{\log_{10}(a)}

\log_{10}(q) \quad \log_{10}(q)

7. \log_{10} z \times \log_{10} y

6. 10^8

5. \Phi = 3

\log_{10}(p) \quad \log_{10}(q) \quad 0

4. \log_{10}(c) \quad 3

3. \log_{10}(q) \quad 3

\frac{z}{y} \times \frac{\log_{10}(c)}{\log_{10}(a)}

\log_{10}(p) \quad \log_{10}(q) \quad 0

2. \log_{10} z = 64 \quad \log_{10}(p) \quad \log_{10}(q)

1. \log_{10} 16 = 2

\text{Answers}

\log_{10}(M) = \log_{10}(H) + \log_{10}(P) + \frac{u}{f}

\text{Note: } A = P \left(1 + \frac{r}{f}\right)^{ft}

5 years

If $400 is deposited in an account that earns 10% annual interest, how much money will be in the account after 10 years?

(9) Evaluate using a calculator.
Problem 1: Computation of the height of the Empire State Building.

1. Use the information given in Illustration 1.
2. Compose the height of the Empire State Building.

Problem 2: Computation of the height of the Gateway Arch.

3. Use the information given in Illustration 5.
4. Compose the height of the Gateway Arch.

Problem 3:

4. Refer to Illustration 4 and find θ.
5. Refer to Illustration 4 and find θ.

Problem 4:

6. Use the information given in Illustration 5.
7. Refer to Illustration 4 and find θ.

Problem 5:

8. Compose the height of the Sears Tower using the information given in Illustration 6 below.

9. Use the information given in Illustration 7 below.

10. Compose the height of the Gateway Arch in Illustration 5.1.
<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \tan(\alpha) = \frac{\sin(\alpha)}{\cos(\alpha)} )</td>
<td>( \tan(\alpha) = \frac{\sin(\alpha)}{\cos(\alpha)} )</td>
</tr>
<tr>
<td>( \cot(\alpha) = \frac{1}{\tan(\alpha)} )</td>
<td>( \cot(\alpha) = \frac{1}{\tan(\alpha)} )</td>
</tr>
<tr>
<td>( \sec(\alpha) = \frac{1}{\cos(\alpha)} )</td>
<td>( \sec(\alpha) = \frac{1}{\cos(\alpha)} )</td>
</tr>
<tr>
<td>( \csc(\alpha) = \frac{1}{\sin(\alpha)} )</td>
<td>( \csc(\alpha) = \frac{1}{\sin(\alpha)} )</td>
</tr>
</tbody>
</table>

In the triangle above the angle \( \alpha \) has the trigonometric relationships:

\[
\begin{align*}
d\theta &= \frac{\sin(\alpha)}{\cos(\alpha)} \\
d\phi &= \frac{\sin(\alpha)}{\cos(\alpha)} \\
d\rho &= \frac{\sin(\alpha)}{\cos(\alpha)}
\end{align*}
\]