Messiah College
MATH 107: Applied Math for Management
Placement Exam Topics and Review

The placement exam is designed to test a student's knowledge of high school-level material that is essential to success in MATH 107. A score of 70% or higher is required to pass the test. Students who score less than 70% will be moved to a section of MATH 102 and are advised to take MATH 107 in a subsequent term. Your placement exam score will count in your course grade as $\frac{1}{4}$ (25 points) of a chapter exam.

The placement exam is to be taken with pencil and paper only; (no calculator). Topics covered on the exam are included in the 27 review problems listed below, taken from the course textbook. Answers can be found at the bottom of the document.

Student tutors are available Aug. 30 – Sept. 1 in Frey 341, 7-9 pm to answer questions about these problems.

<u>Remember that you should be able to do each of these problems without a calculator.</u>

MATH 107 Placement Exam Study Guide

1) Simplify completely

$$44 \div 2 \bullet 11 - 10^2$$

2) Simplify completely

$$(-3)^2 - (-1)^2$$

3) Simplify completely

$$-4^2 - (-4)^2 + 3$$

4) Simplify completely

$$2 - [3 - (2 - |-3|)] + 11$$

5) Simplify completely

$$\frac{(3)(2)(15) - (5)(8)}{(4)(10)}$$

6) Simplify completely:

$$\sqrt{12x^3y^5}$$

7) Simplify completely:

$$\sqrt{1250x^6y^9}$$

8) Simplify completely:

$$\sqrt[3]{24x^4y^4} \bullet \sqrt[3]{45x^4y^{10}}$$

9) Simplify completely:

a) $(\frac{3}{8})^0$ b) $2^3 \bullet 2^{-5}$ c) $\frac{4^9}{4^3}$ d) $(\frac{1}{7})^3(\frac{1}{7})^{-4}$

10) Use the rules of exponents to write each of the following with only positive exponents. Assume the value of x is always nonzero.

a) $x^5 \bullet x^{-7}$ b) $\frac{x^8}{x^{-2}}$ c) $(x^3)^3$ d) $(x^4)^{-2}$

e) $(-x^{-3})^{-2}$

11) Simplify by combining like terms:

$$(3x+5)-(4x+7)$$

12) Simplify:

$$(4xy^3)(6x^4y^2)$$

13) Simplify:

$$x^{4/3}(x^{2/3}-x^{-1/3})$$

14) Factor completely:

$$2x^4 - x^3$$

15)Factor completely:

$$2x^4 - 8x^2$$

16)Reduce each fraction to lowest terms:

a) $\frac{2x}{2x+4}$

b) $\frac{4x^2y^3 - 6x^3y^4}{2x^2y^2 - 3xy^3}$

17) Perform the indicated operations and simplify:

$$1 + \frac{3}{2x} - \frac{1}{6x^2}$$

For problems 18-24, solve for x:

18) $3x - 8 = 22$

19) $2x - 8 = 3x + 5$

20) $\frac{6x+3}{6} = \frac{5(x-2)}{9}$

21) $2x + \frac{1}{2} = \frac{x}{2} + \frac{1}{3}$

22) $$\frac{6}{3x-5}=\frac{6}{2x+3}$$

23) $$\frac{2x+5}{x+7}=\frac{1}{3}+\frac{x-11}{2x+14}$$

24) $$3(y-2)=-2(x+5)$$

25) In an attempt to determine some off-the-job factors that might be indicators of on-the-job effectiveness, a company made a study of 200 of its employees, to find out whether the employees had been recognized for superior work by their supervisors, whether they were involved in community activities, and whether they followed a regular exercise plan. The company found the following:

30 answered 'yes' to all three questions
50 were recognized and they exercised
52 were recognized and were involved in the community
77 were recognized
37 were involved in the community but did not exercise
95 were recognized or were involved in the community
95 answered 'no' to all three

a) Draw a Venn diagram that represents this information.

b) How many exercised only?

c) How many exercised or were involved in the community?

26) The percent of the U.S. population covered by an employment-based health insurance plan can be approximated by the expression

$$-0.75x+63.8$$

where x is the number of years past 2000. Use this expression to estimate the percent covered by such a plan in the year 2016.

27) The number of species of endangered animals, A, can be described by

$$A=10x+167.90$$

where x is the number of years past 1980.

a) To what year does x=17 correspond?

b) What x-value corresponds to the year 2007?

c) If this equation remains valid, in what year will the number of species of endangered animals reach 461?

MATH 107 Placement Exam Study Guide Answers

Review Problem answers

1) Simplify completely

$$44 \div 2 \bullet 11 - 10^2$$

142

2) Simplify completely

$$(-3)^2 - (-1)^2$$

8

3) Simplify completely

$$-4^2 - (-4)^2 + 3$$

-29

4) Simplify completely

$$2 - [3 - (2 - |-3|)] + 11$$

9

5) Simplify completely

$$\frac{(3)(2)(15) - (5)(8)}{(4)(10)}$$

1.25 or 5/4

6) Simplify completely:

$$\sqrt{12x^3y^5}$$

$$2xy^2\sqrt{3xy}$$

7) Simplify completely:

$$\sqrt{1250x^6y^9}$$

$$\underline{25x^3y^4\sqrt{2y}}$$

8) Simplify completely:

$$\sqrt[3]{24x^4y^4} \bullet \sqrt[3]{45x^4y^{10}}$$

$$\underline{6x^2y^4\sqrt[3]{5x^2y^2}}$$

9) Simplify completely:

a) $(\frac{3}{8})^0$ b) $2^3 \bullet 2^{-5}$ c) $\frac{4^9}{4^3}$ d) $(\frac{1}{7})^3(\frac{1}{7})^{-4}$

a) $\underline{1}$ b) $\underline{2^{-2} \text{ or } \frac{1}{4}}$ c) $\underline{4^6 \text{ or } 4096}$ d) $\underline{7}$

10) Use the rules of exponents to write each of the following with only positive exponents. Assume the value of x is always nonzero.

a) $x^5 \bullet x^{-7}$ b) $\frac{x^8}{x^{-2}}$ c) $(x^3)^3$ d) $(x^4)^{-2}$ e) $(-x^{-3})^{-2}$

a) $\underline{\frac{1}{x^2}}$ b) $\underline{x^{10}}$ c) $\underline{x^9}$ d) $\underline{\frac{1}{x^8}}$ e) $\underline{x^6}$

11) Simplify by combining like terms:

$$(3x+5)-(4x+7)$$

$$\underline{-x-2}$$

12) Simplify:

$$\frac{(4xy^3)(6x^4y^2)}{24x^5y^5}$$

13) Simplify:

$$x^{4/3}(x^{2/3} - x^{-1/3})$$

$$x^2 - x$$

14) Factor completely:

$$2x^4 - x^3$$

$$x^3(2x-1)$$

15) Factor completely:

$$2x^4 - 8x^2$$

$$2x^2(x^2-4)$$

16) Reduce each fraction to lowest terms:

a) $\frac{2x}{2x+4}$

b) $\frac{4x^2y^3 - 6x^3y^4}{2x^2y^2 - 3xy^3}$

a) $\frac{x}{x+2}$

b) $\frac{2xy(2-3xy)}{2x-3y}$

17) Perform the indicated operations and simplify:

$$1+\frac{3}{2x}-\frac{1}{6x^2}$$

$$\frac{6x^2+9x-1}{6x^2}$$

For problems 18-24, solve for x:

18) $3x-8=22$

x=10

19) $2x-8=3x+5$

x=-13

20) $\frac{6x+3}{6}=\frac{5(x-2)}{9}$

$$x=-\frac{29}{8}$$

21) $2x+\frac{1}{2}=\frac{x}{2}+\frac{1}{3}$

$$x=-\frac{1}{9}$$

22) $\frac{6}{3x-5}=\frac{6}{2x+3}$

x=8

23) $$\frac{2x+5}{x+7}=\frac{1}{3}+\frac{x-11}{2x+14}$$

No solution

24) $$3(y-2)=-2(x+5)$$

$$x=-\frac{3}{2}y-2$$

25) In an attempt to determine some off-the-job factors that might be indicators of on-the-job effectiveness, a company made a study of 200 of its employees, to find out whether the employees had been recognized for superior work by their supervisors, whether they were involved in community activities, and whether they followed a regular exercise plan. The company found the following:

30 answered 'yes' to all three questions
50 were recognized and they exercised
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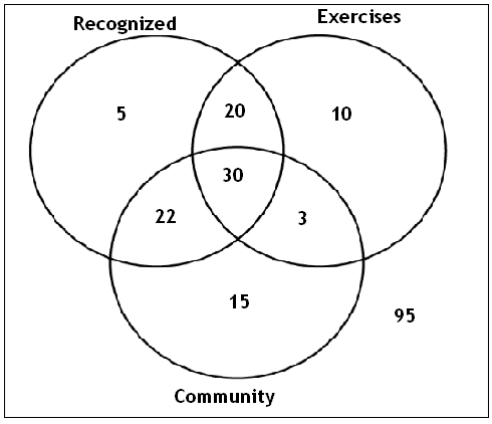
37 were involved in the community but did not exercise
95 were recognized or were involved in the community
95 answered 'no' to all three

d) Draw a Venn diagram that represents this information.



e) How many exercised only?

10

f) How many exercised or were involved in the community?

100

26)

The percent of the U.S. population covered by an employment-based health insurance plan can be approximated by the expression

$$-0.75x+63.8$$

where x is the number of years past 2000. Use this expression to estimate the percent covered by such a plan in the year 2016.

51.8%

27) The number of species of endangered animals, A, can be described by

$$A=10x+167.90$$

where x is the number of years past 1980.

d) To what year does x=17 correspond?

1997

e) What x-value corresponds to the year 2007?

x=27

f) If this equation remains valid, in what year will the number of species of endangered animals reach 461?

2009