

Diagnostic Test

Math 1010 – Intermediate Algebra (or equivalent) is a prerequisite for M1030. This means that you should have a working knowledge of intermediate algebra. This diagnostic test covers some of this background material. You should give yourself this test and then check your answers with the solution sheet provided in class.

1. Three kinds of apples are all mixed up in a basket. How many apples must you draw (without looking) from basket to be sure of getting two apples of one kind?

2. There are 150 people in a class. If 80% of them are registered, how many are not registered?

3. Express "three-fifths" as a fractions, a decimal, and as a percentage.

4. Evaluate each of the following if $a = 4$, $b = \frac{2}{5}$, $c = -6$:

$$a(b+c) \quad ab + c \frac{a}{b} - c \quad 5b - 3c^2$$

5. Evaluate the following expressions on your calculator:

$$(250 / (34 + 56)) \times 27 \quad 23 \frac{5}{7} + 6.3 (4^5) \quad 3\sqrt{32} - \sqrt{15}$$

6. Simplify:

$$\text{a) } \frac{x^5 x^2}{x^{-3}} \quad \text{b) } (x^{-2} y^3)^2 \quad \text{c) } (x^{-5} y^4)^2 (x^0 y^{-2})^2$$

7. If there are 1.43 US dollars in one Euro, which is smaller, one US dollar, or one Euro?

8. One number is 6 times a second number. Find the numbers if their difference is 102.

9. If you drive at an average speed of 65 miles per hour, how long will it take you to drive 530 miles? If you can bike a distance of 45 miles in three hours and 15 minutes, what is your average biking speed in miles per hour?

10. The length of a rectangle is 14 inches more than its width. If the area is 72 square inches, find the length and width of the rectangle.

11. Suppose that three-quarters of the freshmen live in a dorm. If two-thirds of the freshmen dorm residents are women, what percentage of the freshman class are women who live in the dorm?

12. Solve for x in the following equations:

$$3x - 5 = 9 + 7x$$

$$x^2 - 5 = 31$$

$$x^2 - x - 12 = 0$$

$$\frac{x-3}{5} = \frac{x}{2}$$

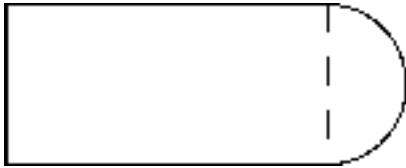
$$|x+3| = 10$$

13. Solve for x and y: a) $3x - 2y = 5$ b) $x + y = 7$.

14. Graph the line $5x - 2y = 6$. What is the y-intercept?

15. A warehouse may contain bicycles, tricycles, and cars. Altogether there are 18 wheels in the warehouse. How many bicycles, tricycles, and cars are there? Give as many answers as possible.

16. The playground drawn below is in the shape of a rectangle with a semicircle attached as shown. Suppose that the longer side of the rectangle is twice the length of the shorter side and that the radius of the semicircle is 12 feet. What is the perimeter and the area of the playground?



17. Suppose that the ratio of undergraduate students to graduate students in an institution is 20:7. What percentage of the student body are graduate students?

18. Suppose that your annual tuition as a freshmen was \$5,300. Each year tuition has increased 4%. Now you are in your senior year. What is your annual tuition this year?

19. The company you work for was doing poorly two years ago and as a result everyone took a 10% cut in pay for the last year. The company is doing better now and the CEO has just promised to raise everyone's salary 10% for next year. Does this mean that your salary next year will be same as it was two years ago? Explain.

20. Find the slope, x-intercept, and y-intercept: $7y - 2x = 15$. Graph the line.

21. Solve the following equations:

a) $2x^4 = 162$

b) $2x^5 - 6 = 17$

c) $\sqrt{5x-7} = 13$

d) $(4-5x)^{1/7} = -13$

22. Determine any errors made in the work shown below. Then explain the mistake made.

$$\begin{aligned} \text{a) } \frac{3(-5) + x(3)}{3} &= 1 \Rightarrow \text{"cancel 3"} \\ -5 + 3x &= 1 \Rightarrow \text{"add +5 to both sides"} \\ 3x &= 6 \Rightarrow \text{"subtract 3 from both sides"} \\ x &= 3 \end{aligned}$$

$$\text{b) } 2\left(\frac{x+3}{5}\right) = x \Rightarrow \text{"add -3 to both sides"}$$

$$\frac{2(x)}{5} = x + -3 \Rightarrow \text{"multiply by 5"}$$

$$2x = 5x - 15 \Rightarrow \text{"subtract 2"}$$

$$x = 5x - 17 \Rightarrow \text{"subtract 5x"}$$

$$-4x = -17 \Rightarrow \text{"subtract -4"}$$

$$x = -21$$

$$\text{c) } 5(x^2 y^3) = 5x^2 5y^3 = 25x^2 y^3$$

$$23. \text{ Solve: a) } y - 0.52y = 1.2 \quad \text{b) } a + 7(3.5a) - 2 = \frac{3}{5}$$

$$24. \text{ If } a = 0.35, b = 1.47, c = -4.76, \text{ find: } \frac{b - a\sqrt{1 + 2b^3 - c} - 1}{(a^2 + 1)^{-3}}$$

SOLUTIONS:

1. If you draw 4 apples you will be sure that you will get 2 apples of one kind.

2. registered: $0.8 \times 150 = 120$ people

150 - 120 = 30 not registered

3. $3/5$, 0.6, 60%

4. a) $-112/5$ b) $-262/5$ c) -106

5. a) 75 b) 6474.91 c) 13.098

6. a) x^{10} b) $x^{-4}y^6 = \frac{y^6}{x^4}$ c) $x^{-10}y^4 = \frac{y^4}{x^{10}}$

7. One US dollar is smaller.

8. 20.4, 122.4

9. 8.15 hrs, 13.85 mi/hr

10. L=18 in. W=4 in.

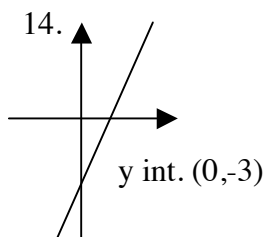
11. $2/3 \times 3/4 = 1/2$

12. a) $-7/2$ b) 6,-6 c) 4, -3

d) -2 e) 7, -13

13. a) $x = \frac{5+2y}{3}$, $y = \frac{5-3x}{-2} = \frac{3x-5}{2}$

b) $x = 7 - y$, $y = 7 - x$



15. (B,T,C) : (0,2,3), (0,6,0), (1,0,4),
(1,4,1), (2,2,2), (3,0,3), (3,4,0), (9,0,0),...

22. a) need to factor out 3 first before simplifying;

need to divide both sides by 3 (not subtract 3)

b) do not add -3 to both sides;

can not subtract 2 (need to divide by 2) both sides;

divide by -4 (not subtract) both sides

c) $5(x^2y^3) = 5x^2y^3$

16. $P = 120 + 12\pi \approx 157.7$ ft

$A = 1,152 + 72\pi \approx 1,378.2$ ft²

17. $7/27 = 25.93\%$

18. \$ 5,961.78

19. 2 years ago: salary = x

Last year : $x - 0.1x = 0.9x$

This year: $0.9x$

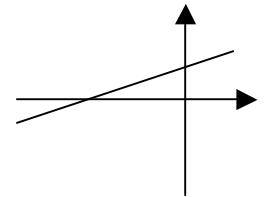
Next year: $0.9x + 0.1(0.9x) =$
 $= 0.99x$

Answer: NO

20. x-int: $(-15/2, 0)$

y-int: $(0, 15/7)$

slope = $2/7$



21. a) 3 b) 1.63 c) 35.2

d) 12,549,704.2

23. a) 2.5 b) 0.102

24. -1.058