The Blue Print for 0308 Exit Assessment

Introduction

This blueprint is intended as a guide to writing an exit assessment instrument for Math 0308. The outcomes listed represent the skills that should be assessed as students exit this level of developmental math at any college in the district. The examples listed are to be used for reference only. These questions are examples of the type of skill-based questions that might be asked to assess a particular outcome. They also give an idea of the level of difficulty that should be used in final assessment. These problems, taken as a whole, would serve as a good review of the basic skills that are necessary for a student to be a successful Math 0310 student.

Guidelines for Exit Assessment in Math 0308:

1. All exit assessment instruments developed in the district for Math 0308 must cover the skills represented in each of the nine outcomes. The exit assessment instrument must contain questions from each outcome. The total weights for all questions related to a given outcome should equal the percent allocated to that outcome ±1.
2. All questions on the exit assessment must represent one or more of the nine outcomes. A given question from an exit assessment instrument may measure multiple outcomes. Any outcome may be measured using applications.
3. The grade value for each district exit assessment instrument should count as much as a major exam but no more than 20% of the student's final average.
4. To earn a final grade of 'C' or higher in Math 0308 a student must achieve a score equal to or greater than a threshold score on the exit assessment instrument. Each college should establish a threshold score equal to or greater than 50%.
5. Each college should develop well-defined criteria for the assigning of the grade of 'IP' and 'F.'

Guidelines 6 – 9 apply to colleges using Departmental Final Exit Assessment or Individual Final Exit Assessment.

6. Students whose overall class average is above 70% (this 70% includes the grade earned on the exit assessment), but whose exit assessment score is less than the college's threshold score, will have the opportunity to retest. Guidelines for the retest will be developed at each individual college.
7. Eligible students must retest by a date established by the mathematics Exit Assessment Coordinators.
8. Only one retest will be allowed.
9. If a student achieves the college's threshold score on the retest, the student's final grade will be the letter grade appropriate to his or her original average, computed using the "original" final. That is, the retest will only be used as exit criteria, not in the determination of the student's final average or letter grade.

Guidelines 10 – 12 apply to colleges utilizing Outcome Evidence Building (OEB).

10. Each particular outcome exam may be retaken at least once. Each college should establish the maximum number of "retakes."
11. The final exit assessment grade for testing by OEB is the weighted average (based on the weights given below) of the maximum scores a student achieves on each outcome exam.
12. All outcome exams must be completed according to a time schedule determined by the college.

Outcome 1: Solve linear equations and inequalities. (weight = 15%)

The student will solve linear equations in one variable that result in unique solutions.

Examples: Solve the following equations

1. $3x+5=8$
2. $2(4x-3)+5=3(2x+1)+2$
3. $\frac{x}{2}+\frac{3x}{4}=7$
4. $\frac{x-1}{3}+\frac{x+2}{5}=\frac{x+3}{15}$

The student will solve linear equations in one variable that are identities or contradictions.

Examples: Solve the equation. Identify any identities or contradictions.

1. $3(x+5)-2x=x+15$
2. $\frac{x-3}{2}+\frac{x+5}{3}=x-\frac{x+2}{6}$

The student will solve simple formulas for a specified variable.

Examples: Solve each formula for the specified variable.

1. $I=\text{Pr}t$ for r
2. $F=\frac{9}{5}C+32$ for C

The student will solve linear inequalities in one variable and be able to represent the answer on a number line and in interval notation.

Examples: Solve the inequality. Graph the solution set and write it in interval notation.

1. $x-11\geq 2x+7$
2. $-5x+7<2(x-3)$

The student will solve compound inequalities in one variable and represent the answer on a number line and in interval notation.

Examples: Solve each inequality. Graph the solution set and write it in interval notation.

1. $-4\leq 6-5x<11$
2. $-6<3(x-2)\leq 8$

Outcome 2: Use linear equations and inequalities to solve applications. (weight = 5%)

Solve linear applications, including but not limited to, problems involving the dimensions of geometric figures, mixtures, uniform motion, and simple interest.

Examples

1. A 128-inch board is cut into three pieces. The second piece is 33 inches longer than the first piece, and the third piece is three times as long as the first. Set up an equation and solve it to determine the length of each of the three pieces.

2. Joe is planning a rectangular garden for spring, and he needs to fence it to keep the rabbits out. He has 54 m. of fencing to go around the perimeter of the garden, and he wants the length of the garden to be 9 m. more than twice the width. Set up an equation and solve it to find the length and the width of Joe's garden.

3. One angle of a triangle is 12 degrees more than the second angle. The third angle is twice the measure of the second angle. Set up an equation and solve it to find the measures of all three angles.

4. Courtney left Tomball College traveling south at a rate of 55 mph. Sonya left Tomball College heading north at a rate of 45 mph. Assuming they keep driving at the same rates, how long will it be before they're 50 miles apart?

5. An antique clock was purchased for $125. It has been increasing in value in a linear pattern at a rate of $35 per year. Write an equation to model the clock's value (y) as a function of the number of years (x) from time of purchase. Use your model to determine how many years it will take for the clock to have a value of $405.

6. How many milliliters of a 60% solution of a particular medication must a nurse add to 15 milliliters of a 30% solution of the medication to obtain a 51% solution of the medication?

7. How much money must Sam invest now in a money market account paying 2% annual (simple) interest in order to have $1500 in ten years?

8. Find the original price of a pair of shoes if the sale price is $78 after a 25% discount.

9. A jet plane traveling at 500 miles per hour overtakes a propeller plane traveling at 200 mph that had a 2 hour head start. How far from the starting point are the planes?

10. How much pure acid should be mixed with 2 gallons of a 40% solution acid in order to get a 70% solution?

11. Zoya Lon invested part of her $25,000 advance at 8% annual simple interest and the rest at 9% annual simple interest. If her total yearly interest from both accounts was $2135, find the amount invested at each rate.

The student will solve application problems that may be modeled as linear inequalities in one variable.

Example: A surprise retirement party is being planned for Pratep Puri. A total of $860 has been collected for the event, which is to be held at a local reception hall. This reception hall charges a cleanup fee of $40 and $15 per person for drinks and light snacks. Find the greatest number of people that may be invited and stay with $860.

Outcome 3: Sketch graphs of linear relations. (weight = 15%)

The student will identify the quadrants, axes and origin in a Cartesian plane and will plot points in the plane.

Examples: Plot the following points. If they lie on an axis, specify which one. If they lie in a quadrant specify which one.

1. (3,-4) 2. (-7,-2) 3. (5,0) 4. (0,-6)

The student will graph a linear equation by finding and plotting ordered pair solutions.

Example: Complete the table to locate 3 solutions of the linear equation. Plot the points and sketch the graph of the line. $y = 3x - 4$

x	*y*
-1	
0	
1	

The student will graph a linear equation by finding and plotting the x and y intercepts.

Examples: Sketch the graph of the linear equation by finding and plotting the intercepts

1. $5x - 3y = 15$ 2. $4x = 10 - 3y$

The student will graph a linear equation using the slope and the y intercept.

Examples: Use the slope intercept form to graph each equation.

1. $y = \frac{3}{5}x - 4$ 2. $3x - 4y = 8$

The student will identify and graph vertical and horizontal lines

Examples: Sketch the graphs of the following linear equations.

1. $x = 5$ 2. $2y - 5 = 7$

Outcome 4: Simplify expressions using definitions and laws of integer exponents. (weight = 10%)

Examples

1. Evaluate $(6X)^0$

2. Express using positive exponents 4^{-3}

3. Multiply and simplify $5^8 \bullet 5^{-2}$

4. Divide and simplify $\dfrac{P^2}{P^{-7}}$

5. Simplify $\left(-3a^2\right)^4$

6. Simplify $\left[\dfrac{x^3y}{Z^5}\right]^5$

7. Write the number in Scientific notation 0.000000927017

8. Convert to decimal notation 8.166×10^7

9. Evaluate x^2-5 when x = 5

10. Perform the indicated operation; write the answer in scientific notation $\dfrac{6\times10^{-3}}{3\times10^9}$

Outcome 5: Add, subtract, multiply and divide polynomials. (weight = 10%)

Be able to understand the terminology of polynomials (specifically, degree, term, factor, coefficient, monomial, binomial and trinomial) and write polynomials in standard form.

Examples

State the degree of the following polynomials and classify them as monomial, binomial or trinomial:

(1) $3x^5 - 7x$ (2) $-5x^2y$ (3) $\frac{12x}{5} - x^2 + 2$

Be able to add polynomials by identifying and combining like terms.

Examples

1. $(5x^2 + 3x - 2) + (x^3 - 4x^2 - x + 7)$
2. $(2a^2 - 3ab + c) + (a^2 + 6ab - 8c)$
3. $3(2x^2 - 9x + 4) + 5(x^2 + 6x + 2)$

Be able to subtract polynomials by identifying and combining like terms.

Examples

1. $(x^2 - 3xy + 2y + 5y^2) - (4x^2 + 6xy - 2y^2 - 3x)$
2. $(-5m^3 + 3m^2 - m + 15) - (2m^3 + m^2 - 6m - 5)$
3. A company has determined that the polynomial, $4x^2 + 700x - 12{,}000$, represents the company's monthly revenue in dollars. The polynomial, $3x^2 - 500x + 10{,}000$, represents the company's monthly cost in dollars. If profit equals revenue minus cost, find a polynomial that represents the company's monthly profit.

Be able to multiply polynomials (including special products) by using the distributive property and laws of exponents.

Examples

1. $-3x^2y(4x^3 + 6x^2y - xy^2 + 5y^3)$
2. $(6x + 6)(2x - 9)$
3. $(3x - 2)(3x + 2)$
4. $(2x - y)(x + 7y)$
5. $(6x - 3)^2$
6. $(2x - 5)(3x^2 + 9x - 2)$

Outcome 5 (continued):

***Be able to divide a polynomial by a monomial using laws of exponents*.**

Examples

1. $\dfrac{7x^5 - 21x^3 + 15x^2 - 9x}{3x}$

2. $\dfrac{8a^5b^3 - 6a^2b^2 + 12ab^4}{10a^2b^2}$

***Be able to divide a polynomial by a polynomial using long division*.**

Examples

1. $(x^3 + 3x^2 - 11x + 3) \div (x - 3)$

2. $\dfrac{4x^2 + 11x + 7}{x + 4}$

3. $\dfrac{12x^3 - 25x^2 + 2}{4x - 1}$

4. $(9x^2 - 42x + 49) \div (3x - 7)$

Outcome 6: Factor polynomial expressions. (weight = 15%)

***Factor polynomials using the distributive property*.**

Examples

Completely factor each polynomial:

1. $8x+12y-16z$
2. $16x^4-32x^3+48x^2$
3. $25x^3y^2-35x^2y^3z^2-15xy^4z^3$
4. $6x(x+y)-5y(x+y)$

Factor binomials

Examples

Completely factor each polynomial

1. a^2-25
2. $36x^2-49y^2$
3. $50a^3b-32ab^3$
4. a^3-8
5. $8y^3+125$

Factor Trinomials

Examples

Completely factor each polynomial

1. $x^2-2x-15$
2. x^2+6x+8
3. $-2x^2+20x-42$
4. $x^2+10x+25$
5. $2x^2-5x-3$
6. $12x^2+56x-20$
7. $6x^2+17x+12$
8. $4x^2+12xy+9y^2$

Factor using grouping methods

Examples

Completely factor each polynomial:

1. $2x^2+6xy+5x+15y$
2. $5a^3-10a^2-4a+8$
3. $x^3-2x^2y-16x+32y$

***NOTE: Students should encounter prime polynomials throughout this objective and learn to recognize when a polynomial is prime*.**

Outcome 7: Solve quadratic equations using the factoring method. (weight = 5%)

Recognize quadratic equations

Examples

Which equations are quadratic and which are not quadratic? Be able to explain your answer.

1. $(2x-1)(x+2)=9$
2. $3x+5(2x-1)=10$
3. $4x^2-9=0$
4. $x^3-3x^2+6x+9=0$
5. $\frac{1}{x^2}-\frac{9}{x}+5=0$
6. $\frac{3}{4}x^2-\frac{1}{2}x+\frac{5}{6}=0$

Solve quadratic equations using factoring techniques

Examples

Use factoring to solve the following quadratic equations.

1. $x^2-5x-6=0$
2. $x^2-25=0$
3. $5x^2-7x=0$
4. $3x^2+12x-36=0$
5. $3+5x=2x^2$
6. $(x+2)(x+8)=-5$
7. $54x^2=24$

Outcome 8: Solve system of linear equations in two variables. (weight = 10%)

***Students should recognize that solution represents point of intersection of two straight lines and be able to "estimate" the solution through graphical techniques*.**

Example

1. Estimate the solution to:
   $2X + 3Y = 5$
   $5X - 4Y = 1$
via graphing.

Student should recognize that a system of two equations may not have a solution (e.g. two distinct parallel lines) or have more than one solution (e.g. co-linear equations).

Examples

1. No Solution: $2X + Y = 4$
   $4X + 2Y = 9$

2. Co-linear: $2X + Y = 4$
   $4X + 2Y = 8$

***Student should be able to solve using both substitution and elimination methods, and recognize when one might be preferable to the other. Student must also understand and be able to utilize equation manipulation that may be necessary to solve via the elimination method*.**

Examples

1. (very simple): $X + Y = 1$
   $X - Y = 3$

2. (more difficult, requiring equation manipulation if solving via elimination method): $2X + 3Y = 5$
   $5X - 4Y = 1$

3. (choosing the appropriate method): $Y = -2X$
   $X + 3Y = 5$

Outcome 9: Identify restricted values of rational expressions; reduce, multiply, and divide rational expressions; add and subtract rational expressions with like denominators. (weight = 10%)

Identify restricted values of rational expression.

Examples

Find all numbers for which the rational expression is undefined:

1. $\frac{2}{a-2}$
2. $\frac{x-2}{x^2-4x+4}$

Reduce rational expressions

Examples

1. Simplify $\frac{y^2+4y-32}{y^2+2y-48}$
2. Simplify $\frac{10x}{10x+20}$

Multiply and divide rational expressions

Examples

1. Multiply $\frac{4z^3}{5} \bullet \frac{15}{z^2}$
2. Multiply $\frac{2p-2}{p} \bullet \frac{4p^2}{6p-6}$
3. Divide and simplify $\frac{3x^2}{4} \div \frac{x^3}{20}$
4. Divide and simplify $\frac{8p-8}{5p} \div \frac{10p^2-10p}{8p}$
5. Multiply and simplify $\frac{5-c}{c^2+7c+10} \bullet \frac{c+5}{c-5}$

Outcome 9 (continued):

Add and subtract rational expressions

Examples

1. Add; simplify if possible $\frac{4}{13x}+\frac{7}{13x}$

2. Add; simplify if possible $\frac{m^2-9m}{m-6}+\frac{18}{m-6}$

3. Subtract; simplify if possible $\frac{8}{3-y}-\frac{9}{y-3}$

4. Subtract; simplify if possible $\frac{2x}{x-2}-\frac{4}{x-2}$