

**Postsecondary
Education
Readiness
Test
Mathematics**

HIGHER SCORE GUARANTEED

PERT Math Practice Guide

your math practice and success answer



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PERT Math Overview

The math subtest of the **Postsecondary Education Readiness Test** (PERT or P.E.R.T.) has 30 multiple choice questions. The test is computer adaptive, meaning that the computer program chooses your next question based on your previous answer. Students are not allowed to go back after answering a question. Students cannot use a calculator for most questions on this test - an on-screen pop-up calculator is made available for a few questions. Test questions on the math subtest range from basic algebra through college-level algebra. There is no time limit for completing the math subtest; however, students should schedule at least 2 hours to successfully complete this part of the test. Below are sample questions you can expect to see on the PERT.

Here's a multiple-choice format of a basic algebra question:

Evaluate: $2xy - 3x^2 - 11$ if $x = -4$ and $y = 5$.

- a. -139 b. -99
c. -19 d. 469

SOLUTION:

To evaluate $2xy - 3x^2 - 11$, replace x with -4 and y with 5 and use the order of operations, **G E M D A S**, to simplify.

$$2(-4)(5) - 3(-4)^2 - 11 \quad \text{substitution}$$

$$2(-4)(5) - 3(16) - 11 \quad \text{computed exponent}$$

$$-40 - 48 - 11 \quad \text{multiplication performed}$$

$$-99 \quad \text{add because all numbers are negatives}$$

Answer: choice b.

Here's a harder question taken from intermediate algebra:

Find the standard form of the equation of a line with slope -3 and passing through the point $(-2, 4)$.

- a. $4y = 3x - 2$ b. $-2x + 4y = -3$
c. $y = -3x - 6$ d. $3x + y = -2$

SOLUTION:

To find the equation of this line, use the point-slope formula $y - y_1 = m(x - x_1)$ with $m = -3$ and (x_1, y_1) as the point $(-2, 4)$ then, convert the equation into standard form $Ax + By = C$.

$$y - 4 = -3[x - (-2)] \quad \text{substitute -3 and (-2, 4) into formula}$$

$$y - 4 = -3(x + 2) \quad \text{double negatives = +}$$

$$y - 4 = -3x - 6 \quad \text{distribute -3 to (x + 2)}$$

$$3x + y = -6 + 4 \quad \text{move -3x and -4 to opposite sides (moving to opposite side means changing to opposite sign)}$$

$$3x + y = -2 \quad \text{combine -6 + 4 on right side}$$

Answer: choice d.

Upon completion of the test, students are awarded a score between 50 to 150 points. A high score on the PERT math subtest is 114 points or higher – this is the score range that shows college and career readiness. High school students with a high score on the math subtest will not need to do remediation during their senior year. College students with a high score on the math subtest will be allowed to register for college-level math courses and do not need to do remediation (MAT0018, MAT0028 or any MAT0___ course) at the start of their college education. **Note:** Check with your school or college for their updated PERT testing policy on the number of times students can take and retake the PERT test.

How to Use this Guide

Provided below is a self-paced, guided practice designed for students to achieve success on the math section of the PERT test. To gain the most from this practice, we recommend following each outlined step carefully and completely. Work through the outlined parts: **PART I, PART II AND PART III** as follows:

- **PART I** – Take the **PERT Math Practice Test**, and the **Additional PERT Math Practice Questions** on pages 1 – 4. If there are questions you are not familiar with, skip them and carefully check solution guide.
- **PART II** – Check answers and see prescription guide for PERT Math Practice Test, page 5. Carefully go over all questions using the step-by-step solution and explanation guide, pages 6 – 10
***Pay careful attention to questions you skipped or missed!**
Continue checking answers and solution guide for Additional PERT Math Practice Questions
- **PART III** – Use the **PERT Math Study Guide**, pages 13 – 21, to review guidelines/rules and practice more PERT math questions.
- Take your test! You will need to schedule at least two hours to successfully complete the math section of the PERT.

PART I

PERT MATH PRACTICE TEST & ADDITIONAL PERT MATH PRACTICE QUESTIONS

PERT Math Practice Test

DIRECTIONS: Select the correct answer choice for each question. Upon completion, check the answer key and follow prescription given on page 5 to strengthen areas where questions were missed/skipped.

Do not guess on this practice test; skip questions you are not familiar with and follow directions for these questions given in the prescription guide. Do not use a calculator while working on these practice questions – NO CALCULATORS ALLOWED ON THE PERT – an on-screen pop-up calculator is available for a few questions.

1. Topic: Order of Operations

Simplify: $18 + 8 \div 2(-5) - 4^2$

- a. -10 b. -18
c. -81 d. -73

2. Topic: Evaluating Algebraic Expressions

Evaluate: $2xy^2 - 3xy - 7$ if $x = -4$ and $y = 5$.

- a. -147 b. -133
c. 233 d. 1653

3. Topic: Simplifying Algebraic Expressions

Simplify: $6 - 4[3(2x + 5) - 4x]$

- a. $4x + 30$ b. $8x + 30$
c. $8x + 42$ d. $-8x - 54$

4. Topic: Solving Equations

Solve for y: $4 - (y - 5) - (y + 3) = 2$

- a. $-\frac{25}{2}$ b. -5
c. 2 d. $\frac{19}{5}$

5. Topic: Solving Equations

Solve for x: $0.2(2x - 1) = 0.2x + 0.08$

- a. 1.4 b. 5
c. -2 d. $0.\bar{3}$

6. Topic: Solving Formulas

Solve the formula $3x + 4y = 12$, for y .

- a. $4y = 12 - 3x$ b. $y = \frac{9}{4}$
c. $y = -3x - 8$ d. $y = -\frac{3}{4}x + 3$

7. Topic: Solving Proportions

Solve the equation: $\frac{x - 4}{x} = \frac{3}{5}$

- a. $x = -5$ b. $x = -6$
c. $x = 10$ d. $x = 2$

8. Topic: Solving Inequalities

Find all solutions of $5 - 2x + 7 \geq 6$.

- a. $x \geq -3$ b. $x \leq 3$
c. $x \geq 3$ d. $x \leq -3$

9. Topic: Solving Word Problem Situations

Set up the equation that can be used to solve the following: "Eight less than the square of a number is the same as adding the number and four." Use x to represent the unknown number.

- a. $8 - x^2 = x + 4$ b. $x^2 - 8 = x + 4$
c. $2x - 8 = x + 4$ d. $8 - 2x = x + 4$

10. Topic: Solving Word Problem Situations

The perimeter of a rectangular swimming pool is 30 meters. The width of the pool is 3 meters less than its length; find the width of this swimming pool.

- a. 10 meters b. 9 meters
c. 6 meters d. 3 meters

11. Topic: Scientific Notation

Write the number 34,120,000 using scientific notation.

- a. 3.412×10^7 b. 3.412×10^{-7}
 c. 34.12×10^{-7} d. 34.12×10^6

12. Topic: Simplifying Exponent Expressions

Simplify: $(-8x^4y^3)(-6xy^{-7})$

- a. $-48x^4y^{-7}$ b. $-48x^4y^{-10}$
 c. $\frac{48x^5}{y^4}$ d. $\frac{-48x^4}{y^3}$

13. Topic: Dividing polynomials

Divide: $\frac{9x^2y - 12xy^2 + 3xy}{3xy}$

- a. $6x - 9y$ b. $3x - 4y$
 c. $3x - 4y + 1$ d. $3x^2 - 4y + xy$

14. Topic: Subtracting polynomials

Subtract: $(7x^3 - 6x^2 + 2x) - (5x^2 + 8x - 3)$

- a. $7x^3 - 11x^2 - 6x + 3$ b. $-3x$
 c. $7x^3 - 11x^2 + 10x - 3$ d. $-4x^3 + 10x - 3$

15. Topic: Multiplying Polynomials

Multiply: $(2m - 5n)(4m + n)$

- a. $8m^2 - 5n^2$ b. $8m^2 - 18mn - 5n^2$
 c. $8m^2 + 5n^2$ d. $8m^2 + 18mn + 5n^2$

16. Topic: Multiplying Polynomials

Multiply: $(4n - 3)^2$

- a. $16n^2 + 9$ b. $16n^2 - 24n + 9$
 c. $16n^2 - 9$ d. $8n^2 - 6$

17. Topic: Multiplying Polynomials

Find the product for $(2k^2 - 6k + 9)(k + 3)$

- a. $2k^3 - 12k^2 + 9k + 27$ b. $2k^3 - 9k + 27$
 c. $2k^3 - 12k^2 - 27k - 27$ d. $2k^3 + 9k^2 - 9k - 27$

18. Topic: Factoring

Factor completely: $4x^2 - 16$

- a. $(2x - 4)(2x + 4)$ b. $(2x + 4)(x - 4)$
 c. $4(x - 2)(x + 2)$ d. $(2x - 4)(x + 4)$

19. Topic: Factoring

Factor completely: $9x^2 - 30x + 25$

- a. $(3x - 5)^2$ b. $(3x + 5)^2$
 c. $(3x - 5)(3x + 5)$ d. $(9x - 5)(x - 5)$

20. Topic: Factoring

Factor completely: $4x^3 + 12x^2 + x + 3$

- a. $(x + 3)(4x^2 + 1)$ b. $4x^2(x + 3)$
 c. $4(x - 3)(4x^2 - 1)$ d. $(x + 3)(2x + 1)^2$

21. Topic: Factoring

What is one factor of the trinomial $3x^2 - 2x - 8$?

- a. $x + 2$ b. $3x - 2$
 c. $x - 8$ d. $3x + 4$

22. Topic: Solving Quadratic Equations

What is one solution of $4a^2 + 20a = 0$?

- a. $a = -20$ b. $a = -5$
 c. $a = 4$ d. $a = 5$

23. Topic: Solving Quadratic Equations

Solve the equation: $x^2 - 10x + 24 = 0$

- a. $x = -12$ or 2 b. $x = -6$ or -4
 c. $x = 6$ or 4 d. $x = 2$ or 12

24. Topic: Simplifying Rational Expressions (Fractions)

Simplify: $\frac{x^2 - 4x + 4}{x^2 - 5x + 6}$

- a. $\frac{4x + 4}{5x + 6}$ b. $\frac{x + 2}{x + 3}$
 c. $\frac{2}{3}$ d. $\frac{x - 2}{x - 3}$

25. Topic: Simplifying Radicals

Simplify: $\sqrt{27a^8b^7}$

- a. $3a^4b^3\sqrt{3b}$ b. $3a^2b^3\sqrt{3a^2b}$
 c. $3a^3b^3\sqrt{3}$ d. $-3a^2b^3\sqrt{3a^2b}$

26. Topic: Multiplying Radicals

Multiply: $(\sqrt{6} - 4)(\sqrt{6} + 4)$

- a. -10 b. $\sqrt{20}$
 c. 22 d. $\sqrt{6} - 16$

27. Topic: Solving System of Two Equations

Solve the system of two equations for y :

$$\begin{aligned} x + y &= 8 \\ 2x - y &= 10 \end{aligned}$$

- a. $y = -4$ b. $y = 6$
 c. $y = 4$ d. $y = 2$

28. Topic: Finding Intercepts of a Line

Find the x -intercept for the graph $4x - 3y = -12$

- a. $(4, -3)$ b. $(-3, 0)$
 c. $(0, -3)$ d. $(-3, 4)$

29. Topic: Finding the slope of a Line

Find the slope, m , of the line passing through the points $(-4, -3)$ and $(0, -2)$

- a. $m = -\frac{2}{3}$ b. $m = 8$
 c. $m = -4$ d. $m = \frac{1}{4}$

30. Topic: Finding the Equation of Lines

Find the standard form of the equation of a line that passes through the points $(1, 3)$ and $(-2, 5)$.

- a. $y = 4x - 3$ b. $2x + 3y = 11$
 c. $y = -\frac{4}{3}x - 1$ d. $2x - 3y = -4$

Additional PERT Math Practice Questions

DIRECTIONS: Select the correct answer choice for each question below and check answer key and solution guide on page 11.

Note: Do not use a calculator. Calculators cannot be used on most questions on the math section of the PERT test.

1. Topic: Order of Operations	2. Topic: Solving Equations
<p><i>Simplify:</i> $2(3 - 7)^2 - 5(3 + 1)^2$</p> <p>a. -208 b. -110</p> <p>c. -48 d. 0</p>	<p><i>Solve for x:</i> $\frac{5}{3}(x - 2) - 1 = \frac{2}{3}$</p> <p>a. -10 b. 3</p> <p>c. 4 d. -6</p>
3. Topic: Solving Inequalities	4. Topic: Solving Word Problem Situations
<p><i>Solve the inequality:</i> $-3 < y - 5 < 3$</p> <p>a. $2 < y < 8$ b. $-8 < y < -2$</p> <p>c. $-15 < y < 15$ d. $-2 < y < 8$</p>	<p>A 20-ft piece of board is cut into two pieces such that the second piece is 2 feet more than twice the first piece; find the length of the longer piece of board.</p> <p>a. 14 feet b. 9 feet</p> <p>c. 6 feet d. 20 feet</p>
5. Topic: Simplifying Algebraic Expressions	6. Topic: Exponent Rules
<p><i>Simplify:</i> $4(2x - 3) - 6x + 17$</p> <p>a. $2x + 14$ b. $-6x + 13$</p> <p>c. $2x + 5$ d. $-6x + 21$</p>	<p><i>Simplify:</i> $\frac{14m^6n^5}{35mn^8}$ write answer using positive exponents.</p> <p>a. $\frac{14mn^2}{35}$ b. $\frac{2m^6n^3}{5}$</p> <p>c. $\frac{5n^3}{2m^6}$ d. $\frac{2m^5}{5n^3}$</p>
7. Topic: Operations with Polynomials	8. Topic: Factoring Polynomials
<p><i>Multiply:</i> $(y - 4)^3$</p> <p>a. $y^3 - 64$ b. $3y - 12$</p> <p>c. $y^3 + 48y - 64$ d. $y^3 - 12y^2 + 48y - 64$</p>	<p><i>Factor completely:</i> $x^2y - 5xy + 5x - 25$</p> <p>a. $(xy - 5)(x + 5)$ b. $y(x^2 - 5x) + 5(x - 5)$</p> <p>c. $(xy + 5)(x - 5)$ d. prime (cannot be factored)</p>
9. Topic: Solving Quadratic Equations	10. Topic: Finding Slope of a Line
<p><i>Solve:</i> $y^2 + 5y = 6$</p> <p>a. $y = 1$ or -6 b. $y = 2$ or 3</p> <p>c. $y = -2$ or 3 d.</p>	<p><i>Find the slope of the line:</i> $3x - 2y = 4$</p> <p>a. $m = \frac{2}{3}$ b. $m = \frac{3}{2}$</p> <p>c. $m = -\frac{2}{3}$ d. $m = 3$</p>

PART II

ANSWER KEYS & SOLUTION GUIDES

PERT Math Practice Test - Answer Key and Prescription Guide

Answer Key		Prescription Guide
Question	Answer	
		1) Review each missed question using the Solution Guide starting on page 6. 2) Review the suggested topic(s) using the PERT Math Study Guide starting on page 13.
1.	b.	Review topics 1 & 2 – signed numbers & order of operations, then practice questions in exercise set
2.	a.	Review topics 1, 2 & 3 – signed numbers, order of operations & evaluating algebraic expression, then practice questions in each exercise set
3.	d.	Review topics 1, 2 & 3 – signed numbers, order of operations & simplifying algebraic expression, then practice questions in each exercise set
4.	c.	Review topic 4 – solving equations, then practice questions in exercise set
5.	a.	Review topic 4 – solving equations, then practice questions in exercise set
6.	d.	Review topic 4 – solving formulas, then practice questions in exercise set
7.	c.	Review topic 4 – solving proportions, then practice questions in exercise set
8.	b.	Review topic 4 – solving inequalities, then practice questions in exercise set
9.	b.	Review topic 12 – solving word problem situations, also see keyword guide on page 18, then practice questions in exercise set
10.	c.	Review topic 12 – solving word problem situations, also see keyword guide on page 18, then practice questions in exercise set
11.	c.	Review topic 5 – scientific notation, then practice questions in exercise set
12.	a.	Review topic 5 – simplifying exponent expressions, then practice questions in exercise set
13.	c.	Review topic 6 – dividing polynomials, then practice questions in exercise set
14.	a.	Review topic 6 – adding/subtracting polynomials, then practice questions in exercise set
15.	b.	Review topic 6 – multiplying polynomials, then practice questions in exercise set
16.	b.	Review topic 6 – multiplying polynomials, then practice questions in exercise set
17.	b.	Review topic 6 – multiplying polynomials, then practice questions in exercise set
18.	c.	Review topic 7 – general factoring strategy, GCF & DoS, then practice questions in each exercise set
19.	a.	Review topic 7 – perfect square trinomial (PsT), then practice questions in exercise set
20.	a.	Review topic 7 – factor by grouping, then practice questions in exercise set
21.	d.	Review topic 7 – factoring ax^2 trinomials, then practice questions in exercise set
22.	b.	Review topic 8 & 7 – solving a quadratic equations, factoring GCF, then practice questions in each exercise set
23.	c.	Review topic 8 & 7 – solving a quadratic equations, factoring x^2 trinomials, then practice questions in each exercise set
24.	d.	Review topic 9 – simplifying a rational expression, then practice questions in exercise set
25.	a.	Review topic 10 – simplifying a square root, then practice questions in exercise set
26.	a.	Review topic 10 – multiplying square roots, then practice questions in exercise set
27.	d.	Review topic 11 – solving system of two equations, then practice questions in exercise set
28.	b.	Review topic 11 – finding intercepts, then practice questions in exercise set
29.	d.	Review topic 11 – finding the slope of a line, then practice questions in exercise set
30.	b.	Review topic 11 – finding equation of a line, then practice questions in exercise set

PERT Math Practice Test - Solution Guide

Below is a solution guide with step-by-step explanations, tips & tricks for answers to the PERT Math Practice Test.

1. To simplify $18 + 8 \div 2(-5) - 4^2$, use the order of operations, **G E MD AS**.

$$18 + 8 \div 2(-5) - 16 \quad \text{compute Exponents}$$

$$18 + 4(-5) - 16 \quad \text{Divide next}$$

$$18 - 20 - 16 \quad \text{Multiply next}$$

$$-18 \quad \text{Add/Subtract}$$

G E MD AS

1. Grouping symbols first

() [] { } $\frac{\text{division}}{\text{bar}}$
| absolute value

2. Exponents next

3. Working left to right, Multiply or Divide, whichever comes first

4. Working left to right, Add or Subtract, whichever comes first

2. To evaluate $2xy^2 - 3xy - 7$, replace x with -4 and y with 5 and use the order of operations, **G E MD AS**, to simplify.

$$2(-4)(5)^2 - 3(-4)(5) - 7 \quad \text{substitution}$$

$$2(-4)(25) - 3(-4)(5) - 7 \quad \text{do exponents next}$$

$$-200 + 60 - 7 \quad \text{multiplication performed}$$

$$-147 \quad \text{add/subtract}$$

3. To simplify the expression $6 - 4[3(2x + 5) - 4x]$, work inside [] to simplify expression, then distribute -4 and continue to collect like terms.

$$6 - 4[6x + 15 - 4x] \quad \text{distribute 3 to } (2x + 5)$$

$$6 - 4[2x + 15] \quad \text{combine like terms inside []}$$

$$6 - 8x - 60 \quad \text{distribute -4 to } [2x + 15]$$

$$-8x - 54 \quad \text{combine like terms}$$

4. To solve $4 - (y - 5) - (y + 3) = 2$, remove (), collect like terms, and use the properties of equality to solve.

$$4 - 1(y - 5) - 1(y + 3) = 2 \quad \text{use 1 in front of () to help with distribution}$$

$$4 - y + 5 - y - 3 = 2 \quad \text{distribute}$$

$$-2y + 6 = 2 \quad \text{collect like terms}$$

$$-2y = 2 - 6 \quad \text{move 6 to opposite side}$$

when you move to the **opposite side**, change to the **opposite sign**

$$\frac{-2y}{-2} = \frac{-4}{-2} \quad \text{divide by -2, the multiplier of } y$$

$$y = 2$$

Note: You can check answers for these questions on the PERT. Substitute and follow the order of operations.

$$4 - (2 - 5) - (2 + 3) = 2 \rightarrow 4 - (-3) - 5 = 2 \rightarrow 7 - 5 = 2 \rightarrow 2 = 2$$

5. To solve $0.2(2x - 1) = 0.2x + 0.08$, clear decimals by multiplying by 100, then continue to use the properties of equality to solve.

Multiply by 100 to remove decimals from the equation:

$$100 \cdot [0.2(2x - 1)] = 100 \cdot (0.2x) + 100 \cdot (0.08)$$

$$20(2x - 1) = 20x + 8 \quad \text{result after multiplying by 100}$$

$$40x - 20 = 20x + 8 \quad \text{distribute 20 to } (2x - 1)$$

$$40x - 20x = 8 + 20 \quad \text{move like terms to the same side}$$

$$20x = 28 \quad \text{combine like terms to get}$$

$$\frac{20x}{20} = \frac{28}{20} = \frac{14}{10} \quad \text{divide by 20 and simplify fraction}$$

$$x = 1.4$$

Note: You can check answers for these questions on the PERT by substituting and following the order of operations.

$$0.2[2(1.4) - 1] = 0.2(1.4) + 0.08 \rightarrow 0.2(2.8 - 1) = 2.8 + 0.08 \rightarrow$$

$$0.2(1.8) = 3.6 \rightarrow 3.6 = 3.6$$

6. To solve the formula (literal equation) $3x + 4y = 12$, for y , use the properties of equality to isolate y .

$$3x + 4y = 12$$

$$4y = -3x + 12 \quad \text{move 3x to the opposite side}$$

Remember: opposite side, opposite sign

$$\frac{4y}{4} = \frac{-3x}{4} + \frac{12}{4} \quad \text{divide all terms by 4 to isolate } y$$

$$y = -\frac{3}{4}x + 3$$

7. To solve the proportion $\frac{x-4}{x} = \frac{3}{5}$, use cross multiplication and solve the resulting equation.

$$\frac{x-4}{x} = \frac{3}{5} \quad \text{cross multiply}$$

$$3x = 5(x-4) \quad \text{result after cross multiplying}$$

$$3x = 5x - 20 \quad \text{distribute 5 to } (x-4)$$

$$3x - 5x = -20 \quad \text{move } 5x \text{ to opposite side}$$

$$-2x = -20 \quad \text{combine like terms}$$

$$\frac{-2x}{-2} = \frac{-20}{-2} \quad \text{divide by } -2$$

$$x = 10$$

Note: You can check answers for these questions on the PERT by substituting and following the order of operations.

$$\frac{10-4}{10} = \frac{3}{5} \rightarrow \frac{6}{10} = \frac{3}{5} \rightarrow \frac{3}{5} = \frac{3}{5}$$

9. To translate "eight less than the square of a number is the same as adding the number and four," change the following phrases into math expressions.

"eight less than the square of a number" translates to: $x^2 - 8$

"is the same as" translates to: $=$

"adding the number and four" translates to: $x + 4$

Now, putting these expressions together gives: $x^2 - 8 = x + 4$

8. To solve the inequality $5 - 2x + 7 \geq 6$, use the properties of inequalities, ($<$, $>$, \leq , \geq) to solve.

To solve an inequality follow the steps for solving equations.

$$-2x \geq 6 - 5 - 7 \quad \text{move 5 and 7 to opposite side}$$

Remember: opposite side, opposite sign

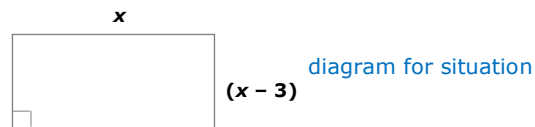
$$-2x \geq -6 \quad \text{simplify right side}$$

$$\frac{-2x}{-2} \geq \frac{-6}{-2} \quad \text{divide by } -2$$

$$x \leq 3$$

* When **dividing by a negative number** in solving an inequality, you must remember to **reverse your inequality symbol**.

10. To solve this word situation, sketch a diagram, set up an equation, solve the equation and answer the question.



$$2(x-3) + 2x = 30 \quad \text{set up equation}$$

$$2x - 6 + 2x = 30$$

$$4x - 6 = 30$$

$$4x = 30 + 6 \quad \text{solve the equation}$$

$$\frac{4x}{4} = \frac{36}{4}$$

$$x = 9$$

Use 9 to replace x in the expression $(x - 3)$ to get $(9 - 3) = 6$ meters.

Note: You can check answers for these questions on the PERT by substituting and adding up the sides.

$$9 + 9 + 6 + 6 = 18 + 12 = 30 \quad \text{and one side is 3 more than the other}$$

11. To simplify $(-8x^4y^3)(-6xy^{-7})$, use the rules of exponents.

Multiply: $-8(-6) = 48$ and $x^4 \cdot x = x^5$ and $y^3 \cdot y^{-7} = y^{-4}$

Putting these together we get: $48x^5y^{-4}$ which rewrites to

$\frac{48x^5}{y^4}$ when using positive exponents.

Exponent Rule:

When multiplying with the same base, add exponents

Negative exponent moves the quantity to the opposite direction in a fraction.

12. To write 34,120,000 using scientific notation, use the scientific notation form, $M \times 10^n$ where M is a number less than or equal to 1 and n is an integer.

Place the decimal point between 3 . 4 then count to the right, the number of places, 7, to get to the original decimal position.

Scientific notation is: 3.412×10^7

The exponent 7 is positive because we counted to the right, a positive direction

13. To divide $\frac{9x^2y - 12xy^2 + 3xy}{3xy}$, separate the expression and divide each term as follows:

Divide each term by 3xy: $\frac{9x^2y}{3xy} - \frac{12xy^2}{3xy} + \frac{3xy}{3xy}$
 $3x - 4y + 1$

Exponent Rule:

When dividing with the same base, subtract exponents

14. To subtract these polynomials, use the distributive property to remove (), then combine like terms. Insert **1's** in front of () to help with the distribution.

$1(7x^3 - 6x^2 + 2x) - 1(5x^2 + 8x - 3)$
 $7x^3 - 6x^2 + 2x - 5x^2 - 8x + 3$ result after distribution
 $7x^3 - 11x^2 - 6x + 3$ collect like terms

15. To multiply $(2m - 5n)(4m + n)$, use the distributive property.

Distribute each term from the 1st () to the 2nd ()
 $2m(4m + n) - 5n(4m + n)$

$8m^2 + 2mn - 20mn - 5n^2$ distribute $2m$ and $-5n$ to each ()

$8m^2 - 18mn - 5n^2$ combine like terms

16. To multiply $(4n - 3)^2$, use the special product technique of squaring a binomial to get a **Perfect Square Trinomial (PsT)**, $a^2 + 2ab + b^2$.

Thus $(4n - 3)^2 = (4n)^2 + 2(4n)(-3) + (-3)^2$
 $= 16n^2 - 24n + 9$

Perfect Square Trinomial (PsT)

Form: $a^2 + 2ab + b^2$

17. To find the product for $(2k^2 - 6k + 9)(k + 3)$, use the distributive property to multiply.

Distribute each term from the 1st () to the 2nd ()
 $2k^2(k + 3) - 6k(k + 3) + 9(k + 3)$

$2k^3 + 6k^2 - 6k^2 - 18k + 9k + 27$ distribute to each ()

$2k^3 - 9k + 27$ combine like terms

18. To factor $4x^2 - 16$ completely, first factor out the GCF, then factor using the **Difference of Squares (DoS)** method.

$4(x^2 - 4)$ factor out GCF

$x^2 - 4 = (x + 2)(x - 2)$ factor DoS

$4(x + 2)(x - 2)$ rewrite final answer

GCF: Greatest Common Factor – the largest quantity common to all terms

Difference of Squares (DoS) Form: $a^2 - b^2$ factor as: $(a + b)(a - b)$

19. To factor completely: $9x^2 - 30x + 25$, use the Perfect Square Trinomial (PsT) method.

Check: $\begin{cases} 9x^2 = (3x)(3x) & \text{Perfect square? (yes)} \\ + 25 = (-5)(-5) & \text{Perfect square? (yes)} \\ - 30x = 2(3x)(-5) & \text{Twice the product of the things being squared, } 3x \text{ and } -5? \text{ (yes)} \end{cases}$

Hence $9x^2 - 30x + 25$ is a perfect square trinomial (PsT), so we can factor as follows: $(3x - 5)^2$

21. To find one factor of the trinomial $3x^2 - 2x - 8$, find the master product, $(3)(-8) = -24$, then find the two factors whose product is -24 and sum -2 : **-6** and **4**. **Use the factors -6 and 4** to split up the middle term, then factor by grouping.

Use **-6** and **4** to split up the middle term:

$$3x^2 - 6x + 4x - 8$$

Use grouping to finish factoring: (see question 20)

$$(3x^2 - 6x) + (4x - 8)$$

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

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

23. To solve the equation $x^2 - 10x + 24 = 0$, use the three steps outlined below:

$$(x - 4)(x - 6) = 0 \quad \text{factor}$$

$$x - 4 = 0 \quad \text{or} \quad x - 6 = 0 \quad \text{use ZFP}$$

$$x = 4 \quad \text{or} \quad x = 6 \quad \text{solve for } x$$

Factoring $x^2 - 10x + 24$ - Since $(-6)(-4) = +24$ and $-6 + (-4) = -10$.

Use **-6** and **-4** to write the pair of factors, see factor step above.

Note: You can check answers for these questions on the PERT by substituting and following the order of operations.

$$(6 - 4)(6 - 6) = 0 \rightarrow 2(0) = 0 \rightarrow 0 = 0 \quad \text{or}$$

$$(4 - 4)(4 - 6) = 0 \rightarrow 0(-2) = 0 \rightarrow 0 = 0$$

20. To factor $4x^3 + 12x^2 + x + 3$, use the grouping method of factoring.

$$(4x^3 + 12x^2) + (x + 3) \quad \text{group in pairs}$$

$$4x^2(x + 3) + 1(x + 3) \quad \text{use GCF to factor each pair}$$

$$(4x^2 + 1)(x + 3) \quad \text{use GCF with } (x + 3)$$

Note: You can check answers for these questions on the PERT by multiplying the answer.

$$4x^2(x + 3) + 1(x + 3) \rightarrow 4x^3 + 12x^2 + x + 3$$

22. To solve $4a^2 + 20a = 0$, factor the left side of the equation, use the Zero Factor Property (ZFP) to set each factor = 0 and solve for both values of a .

$$4a(a + 5) = 0 \quad \text{factor}$$

$$4a = 0 \quad \text{or} \quad a + 5 = 0 \quad \text{use ZFP}$$

$$\begin{array}{l} \frac{4a}{4} = \frac{0}{4} \\ a = 0 \end{array} \quad \text{or} \quad \begin{array}{l} a + 5 = 0 \\ a = 0 - 5 \\ a = -5 \end{array} \quad \text{solve for } a$$

Thus one solution is $a = -5$

Zero Factor Property (ZFP)

If $a \cdot b = 0$, then $a = 0$ or $b = 0$.

Note: You can check answers for these questions on the PERT by substituting and follow the order of operations.

$$4(-5)(-5 + 5) = 0 \rightarrow -20(0) = 0 \rightarrow 0 = 0$$

24. To simplify $\frac{x^2 - 4x + 4}{x^2 - 5x + 6}$, use the process outlined below.

$$\frac{(x - 2)(x - 2)}{\quad \quad \quad} \quad \text{factor numerator}$$

$$\frac{\quad \quad \quad}{(x - 3)(x - 2)} \quad \text{factor denominator}$$

Cancel common factor $(x - 2)$ to get:

$$\frac{(x - 2)\overset{1}{\cancel{(x - 2)}}}{(x - 3)\underset{1}{\cancel{(x - 2)}}} = \frac{x - 2}{x - 3}$$

25. To simplify $\sqrt{27a^8b^7}$, rewrite $\sqrt{27a^8b^7}$ as $\sqrt{9a^8b^6}\sqrt{3b}$, then take the square root of $\sqrt{9a^8b^6}$ to get $3a^4b^3$.

Then rewrite $\sqrt{27a^8b^7}$ as $3a^4b^3\sqrt{3b}$.

27. To solve the system for x , use the elimination method.

$$\begin{array}{r} x + y = 8 \\ 2x - y = 10 \end{array}$$

Add the two equations to eliminate the y variable and solve for x .

$$\begin{array}{r} \cancel{3x} = \frac{18}{3} \\ x = 6 \end{array}$$

Now replace x with 6 in the first equation, $x + y = 8$, and solve for y .

$$\begin{array}{r} 6 + y = 8 \\ y = 8 - 6 \\ y = 2 \end{array}$$

29. To find the slope, m , of a line, use the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

with the points $(-4, -3)$ and $(0, -2)$

$$\text{Slope: } m = \frac{-2 - (-3)}{0 - (-4)} = \frac{-2 + 3}{0 + 4} = \frac{1}{4}$$

26. To multiply $(\sqrt{6} - 4)(\sqrt{6} + 4)$, use the special product method to multiply and obtain the difference of squares.

$$(\sqrt{6})^2 - 4^2 = 6 - 16 = -10$$

28. To find the x -intercept for the graph $4x - 3y = -12$, replace y with 0 and solve for x .

$$4x - 3(0) = -12 \quad \text{replace } y \text{ with } 0$$

$$\frac{4x}{4} = \frac{-12}{4} \quad \text{solve for } x$$

$$x = -3$$

Note: You can check answers for these questions on the PERT. Substitute and follow the order of operations.

$$4(-3) - 3(0) = -12 \rightarrow -12 - 0 = -12 \rightarrow -12 = -12$$

30. To find the equation of the line passing through $(1, 3)$ and $(-2, 5)$, find the slope, m , and use the point-slope formula, $y - y_1 = m(x - x_1)$, to get the equation of the line and convert it to standard form.

$$m = \frac{5 - 3}{-2 - 1} = \frac{2}{-3} = -\frac{2}{3} \quad \text{find slope}$$

Use $y - y_1 = m(x - x_1)$ with $m = -\frac{2}{3}$ and (x_1, y_1) as any of

the two points to get: $y - 3 = -\frac{2}{3}(x - 1)$

$$3(y - 3) = 3\left[-\frac{2}{3}(x - 1)\right] \quad \text{multiply by 3 to clear fraction}$$

$$3(y - 3) = -2(x - 1) \quad \text{result after multiplying by 3}$$

$$3y - 9 = -2x + 2 \quad \text{distribute -2 to } (x - 1)$$

$$2x + 3y = 2 + 9 \quad \text{move } 2x \text{ and } -9$$

$$2x + 3y = 11 \quad \text{add numbers on right side}$$

Note: You can check answers for these questions on the PERT by substituting the points above into the answer.

$$2(1) + 3(3) = 11 \rightarrow 2 + 9 = 11 \rightarrow 11 = 11 \quad \text{and}$$

$$2(-2) + 3(5) = 11 \rightarrow -4 + 15 = 11 \rightarrow 11 = 11$$

ANSWER KEY for Additional PERT Math Practice Questions

Question	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Answer	c	b	a	a	c	d	d	c	a	b

SOLUTION GUIDE
Additional PERT Math Practice Questions

1. To simplify $2(3 - 7)^2 - 5(3 + 1)^2$ use the order of operations, **G E M D A S**.

$$2(3 - 7)^2 - 5(3 + 1)^2 \quad \text{given}$$

$$2(-4)^2 - 5(4)^2 \quad \text{work inside () first}$$

$$2(16) - 5(16) \quad \text{do Exponent next}$$

$$32 - 80 \quad \text{Multiply next}$$

$$-48 \quad \text{Add/Subtract}$$

2. To solve $\frac{5}{3}(x - 2) - 1 = \frac{2}{3}$, multiply by LCD = 3 to clear fractions, then distribute to remove (), and collect like terms, and use the properties of equality to solve.

$$\cancel{3} \frac{5}{1} (x - 2) - \cancel{3} \cdot 1 = \cancel{3} \frac{2}{3} \quad \text{multiply by 3 to clear fractions}$$

$$5(x - 2) - 3 = 2 \quad \text{result after multiplying by 3}$$

$$5x - 10 - 3 = 2 \quad \text{distribute 5 to (x - 2)}$$

$$5x - 13 = 2 \quad \text{collect like terms on left}$$

$$5x = 2 + 13 \quad \text{move -13 to opposite side}$$

when you move to the opposite side, change to the opposite sign

$$\frac{5x}{5} = \frac{15}{5} \quad \text{divide by 5, the multiplier of x:}$$

$$x = 3$$

3. To solve the inequality $-3 < y - 5 < 3$, use the properties of inequalities, ($<$, $>$, \leq , \geq) to solve.

To solve an inequality follow the steps for solving equations.

$$-3 + 5 < y - 5 + 5 < 3 + 5 \quad \text{move -5 to both parts of inequality}$$

$$2 < y < 8 \quad \text{simplify}$$

4. To solve this word situation, sketch a diagram, set up an equation, solve the equation and answer the question.



$$x + 2x + 2 = 20 \quad \text{set up equation}$$

$$3x + 2 = 20$$

$$3x = 20 - 2$$

$$3x = 18 \quad \text{solve the equation}$$

$$\frac{3x}{3} = \frac{18}{3}$$

$$x = 6$$

Use 6 to replace x in the expression $2x + 2$ to get $2(6) + 2 = 14$ feet; therefore the second piece is 14 feet.

5. To simplify the expression $4(2x - 3) - 6x + 17$, use the distributive property for remove () and collect like terms.

$$8x - 12 - 6x + 17 \quad \text{distribute 4 to } (2x - 3)$$

$$2x + 5 \quad \text{collect like terms}$$

Distributive Property

$$a(b + c) = a \cdot b + a \cdot c \quad \text{for all } a, b, c$$

7. To multiply $(y - 4)^3$, rewrite as $(y - 4)(y - 4)(y - 4)$, then use the distributive property to multiply.

Choose the first two binomials and distribute 1st () to the 2nd ():

$$y(y - 4) - 4(y - 4) = y^2 - 4y - 4y + 16 = y^2 - 8y + 16$$

Now multiply $(y - 4)(y^2 - 8y + 16)$

Distribute again: $y(y^2 - 8y + 16) - 4(y^2 - 8y + 16)$

$$y^3 - 8y^2 + 16y - 4y^2 + 32y - 64 \quad \text{after distributing}$$

$$y^3 - 12y^2 + 48y - 64 \quad \text{collect like terms}$$

9. To solve $y^2 + 5y = 6$, first set equation = 0. Then factor the left side of the equation, and use the Zero Factor Property (ZFP) to set each factor = 0 and solve for both values of y .

$$y^2 + 5y - 6 = 0 \quad \text{set} = 0$$

$$(y - 1)(y + 6) = 0 \quad \text{factor (see text box below)}$$

$$y - 1 = 0 \quad \text{or} \quad y + 6 = 0 \quad \text{use ZFP}$$

$$y = 1 \quad \text{or} \quad y = -6 \quad \text{solve for } y$$

Factoring $y^2 + 5y - 6$, since
 $(-1)(6) = -6$ and $-1 + 6 = +5$ (middle #)
 Use -1 and +6 in the pair of factors, see factor step above.

Zero Factor Property (ZFP)

If $a \cdot b = 0$, then
 $a = 0$ or $b = 0$.

6. To simplify, $\frac{14m^6n^5}{35mn^8}$ use the rules of exponents.

$$\text{Simplify: } \frac{14}{35} = \frac{2}{5} \quad \text{and} \quad \frac{m^6}{m} = m^5 \quad \text{and} \quad \frac{n^5}{n^8} = \frac{1}{n^3}$$

$$\text{Putting these together we get: } \frac{2}{5} \cdot \frac{m^5}{1} \cdot \frac{1}{n^3} = \frac{2m^5}{5n^3}$$

Note: $m = m^1$ - variable without exponent is the same as the variable with exponent 1

Exponent Rule: when dividing with the same base, subtract exponents

8. To find one factor of the trinomial $4x^2 - 5x - 6$, find the master product, $(4)(-6) = -24$, from the first and last terms of the given trinomial, then find the two factors whose product is -24 and sum -5: -8 and 3. Use these factors -8 and 3 to split up the middle term, then factor by grouping.

Use -8 and 3 to split up the middle term and rewrite as follows:

$$4x^2 - 8x + 3x - 6$$

Use grouping to finish factoring (see #20 above)

$$(4x^2 - 8x) + (3x - 6) \quad \text{group in pairs}$$

$$4x(x - 2) + 3(x - 2) \quad \text{use GCF to factor each pair}$$

$$(x - 2)(4x + 3) \quad \text{use GCF } (x - 2) \text{ to write both factors}$$

Therefore one factor is $(x - 2)$.

10. To find the slope of the line $3x - 2y = 4$, we solve the equation for y to get the form $y = mx + b$ and identify the slope m .

$$3x - 2y = 4 \quad \text{given}$$

$$-2y = -3x + 4 \quad \text{move } 3x \text{ to opposite side}$$

$$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{4}{-2} \quad \text{divide all terms by } -2, \text{ the coefficient of } y$$

$$y = \frac{3}{2}x - 2 \quad \text{result after dividing by } -2$$

Therefore the slope is $m = \frac{3}{2}$

PART III

PERT MATH STUDY GUIDE

ADDITIONAL MATH RESOURCES & ANSWER KEY

PERT Math Study Guide

'your PERT math companion'

Provided below are the main topics covered on the PERT math section. Included in this math study guide are: PERT Math Topics - Guidelines - Rules, Exercise Sets, Additional Math Resources and an Answer Key.

HOW TO USE THIS GUIDE: Carefully review each topic below and then work on each exercise set – you may need to reference the **topic - guidelines - rules** section several times while working on the exercise set.

DO NOT USE A CALCULATOR WHILE WORKING ON THESE PRACTICE EXERCISES. CALCULATORS CANNOT BE USED ON MOST QUESTIONS ON THE MATH SECTION OF THE PERT TEST.

Topics - Guidelines - Rules	Exercise Set																
Topic 1: Signed Numbers																	
<p><u>Rule for multiplying and dividing signed numbers</u></p> <ol style="list-style-type: none"> An even (0, 2, 4, 6, . . .) amount of negative signs gives a positive (+) answer An odd (1, 3, 5, 7, . . .) amount of negative signs gives a negative (-) answer <p><u>Rule for adding and subtracting signed numbers</u></p> <ol style="list-style-type: none"> Same signs: add and keep sign Two different signs: subtract and keep sign of larger 	<p><i>Perform the indicated operation.</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1) $(-1)^{24}$</td> <td style="width: 25%;">2) -9^2</td> <td style="width: 25%;">3) $(-9)^2$</td> <td style="width: 25%;">4) $-3(-2)(-4)$</td> </tr> <tr> <td>5) $\frac{36}{-4}$</td> <td>6) $\frac{-8}{-48}$</td> <td>7) $-\frac{2}{5} \cdot \frac{15}{8}$</td> <td>8) $\frac{9}{16} \div \frac{15}{8}$</td> </tr> <tr> <td>9) $2.7(-1.4)$</td> <td>10) $-\frac{4}{5} + \frac{1}{3}$</td> <td>11) $7.61 - 19.3$</td> <td>12) $-16 - 21 + 28$</td> </tr> <tr> <td>13) $\left(\frac{2}{3}\right)^3$</td> <td>14) $24\left(\frac{3}{8}\right)$</td> <td>15) $-\frac{3 \cdot 24}{4}$</td> <td>16) $-4.68 \div (-0.9)$</td> </tr> </table>	1) $(-1)^{24}$	2) -9^2	3) $(-9)^2$	4) $-3(-2)(-4)$	5) $\frac{36}{-4}$	6) $\frac{-8}{-48}$	7) $-\frac{2}{5} \cdot \frac{15}{8}$	8) $\frac{9}{16} \div \frac{15}{8}$	9) $2.7(-1.4)$	10) $-\frac{4}{5} + \frac{1}{3}$	11) $7.61 - 19.3$	12) $-16 - 21 + 28$	13) $\left(\frac{2}{3}\right)^3$	14) $24\left(\frac{3}{8}\right)$	15) $-\frac{3 \cdot 24}{4}$	16) $-4.68 \div (-0.9)$
1) $(-1)^{24}$	2) -9^2	3) $(-9)^2$	4) $-3(-2)(-4)$														
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13) $\left(\frac{2}{3}\right)^3$	14) $24\left(\frac{3}{8}\right)$	15) $-\frac{3 \cdot 24}{4}$	16) $-4.68 \div (-0.9)$														

Topic 2: Order of Operations**ORDER OF OPERATIONS (G E MD AS)**

G: Work within **Grouping** symbols first (), [], { },
 | | absolute value, $\frac{\text{division}}{\text{bar}}$

E: Compute **Exponents**

MD: **Multiply** or **Divide** left to right (whichever comes first)

AS: **Add** or **Subtract** left to right (whichever comes first)

Simplify each expression.

1) $-12 - 24 \div 3 \cdot 2 + 8$

2) $(-5)^2 + 4(2)(-3)$

3) $\frac{6 + 16 \div (-2)}{3^2 - 5^2}$

4) $(-15 - 21) \div 3 \cdot 2^3 + 17$

5) $20 - [18 \div (3 \cdot 2) + 8]$

6) $(-1 - 5)^2 \div 3 (7 - 4)^2$

Topic 3: Evaluating/Simplifying Algebraic Expressions and Formulas**Evaluating Algebraic Expressions**

Substitute and carefully follow the order of operations to find the value of the expression

* It is best to use () when you substitute.

Find the value of each expression if $x = 6$, $y = -6$, $z = -\frac{1}{2}$

1) $\frac{-6^2 + xy}{x - y}$

2) $9x + 8yz - 7y$

3) $4z^2 + 3xz - 5z$

Simplifying Algebraic Expressions

Distribute to remove any () then add and subtract like terms

* Like terms: same variable(s), same exponent (s)

Simplify each expression.

4) $7 + 3(5x - 6) - 6x$

5) $[m - 3 - (3m + 1)] - 4$

6) $4y - \frac{2}{3}(6y - 9)$

Evaluating Formulas

Substitute and carefully follow the order of operations to find the value of the missing variable

* Order of operations – see Topic 2 above

Find the value of each formula if $a = 14$, $b = 5$, $c = -1$

7) $P = 2a + 2b$

8) $A = \frac{1}{2}ab$

9) $D = b^2 - 4ac$

Topic 4: Solving Equations, Formulas, Inequalities and Proportions**Guide for Solving Linear Equations**

1. Clear all fractions and decimals by multiplying by the LCD

2. Distribute to remove all ()

3. Move (+, -) to get variable terms on one side and numbers on the other side, then simplify

* when you move a term to the opposite side, you must use the opposite sign

4. Divide on both sides by the coefficient (number) on the variable

Solve each equation.

1) $2 - (x - 3) = 7$

2) $5y - 2 + 4y = 0$

3) $4(y - 5) = 2(y + 5)$

4) $y - 5 = \frac{2}{3}(y + 4)$

5) $\frac{2}{5}x - \frac{1}{5} + \frac{1}{2} = \frac{7}{10} - x$

6) $\frac{x - 3}{4} = \frac{x}{7}$

7) $0.1x + 0.8 = 0.3x - 0.6$

8) $0.03(2x - 1) = 0.1x + 0.08$

For Formulas

Use the Guide for Solving Equations above to isolate the indicated variable

Solve each formula for the indicated variable.

9) $P = 2l + 2w$, solve for w

10) $Ax + By = C$, solve for y

11) $I = Prt$, solve for P

12) $S = \frac{a + b + c}{3}$, solve for b

Divide Polynomials: for monomial divisor

Use the divisor in the denominator to divide each term in the numerator

9) $\frac{m^4 + 4m^2 - m}{m}$

10) $\frac{9x^4 - 6x^3 + 12x^2}{3x^2}$

11) $\frac{8x^4y - 6x^3y + xy}{2xy}$

Topic 7: Factoring**GCF Factoring**

Factor out the greatest factor common to all terms

Use the GCF to factor each expression.

1) $3x^5 - 15x^3 + 3x^2$

2) $xy^2 + 6x^2y - 8xy$

3) $4y^3 - 6y^2 - 8y - 2$

Difference of Squares (DoS): binomial with the form $a^2 - b^2$ Factor as: $(a + b)(a - b)$ *Use the DoS technique to factor each expression.*

4) $x^2 - 25$

5) $4m^2 - 49n^2$

6) $c^6 - 36$

Trinomial I: form $x^2 + bx + c$ **Product-Sum:** Find two factors that multiply to give **c** and add up to give **b**. Use the two factors to write the product as two binomial factors. *see how to write answers to this section in the 'answer key'**Use the product sum method to factor each expression.*

7) $x^2 - 2x - 15$

8) $x^2 - 10x + 24$

9) $y^2 + 13y - 30$

Trinomial II: form $ax^2 + bx + c$, $a > 1$ **Master-Product:** Multiply $a \cdot c$ to get master product (MP), then find two factors that multiply to get the MP. Rewrite trinomial by splitting up the middle term with the two factors and use grouping to factor. See **Grouping** technique below.*Use the master product method to factor each expression.*

10) $2x^2 + 5x + 3$

11) $3n^2 - 7n - 6$

12) $8x^2 - 10x + 3$

Perfect Square Trinomial (PST)Trinomial with the form $a^2 + 2ab + b^2$ Factor as $(a + b)^2$ if middle term is positive (+)Factor as $(a - b)^2$ if middle term is negative (-)*Use the PST technique to factor each expression.*

13) $4x^2 + 20x + 25$

14) $9y^2 - 24y + 16$

15) $4m^2 + 28m + 49n^2$

Grouping: polynomial with 4 terms**Factor:** $x^2 + 5x + 2x + 10$ 1. Group in pairs: $(x^2 + 5x) + (2x + 10)$ 2. GCF factor on each pair: $x(x + 5) + 2(x + 5)$ 3. GCF again with $(x + 5)$ to get: $(x + 5)(x + 2)$ *Use the Grouping technique to factor each expression.*

16) $x^3 + 3x^2 + 5x + 15$

17) $4n^3 - 2n^2 + 6n - 3$

18) $3x^3 - 9x^2 - x + 3$

Factoring Completely – General Strategy

1. Use GCF factoring first (if possible)

2. BINOMIAL – two terms?

Use difference of squares (DoS) technique

3. TRINOMIAL – three terms?

▪ x^2 form: use product-sum▪ ax^2 , $a > 1$ form: use master product and grouping

▪ PST form: use perfect square trinomial (PST) technique

4. FOUR TERMS?

Use grouping technique

Factor each expression completely.

19) $12x^2 - 18x^4$

20) $b^3 - 49b$

21) $5x^2 - 25x - 30$

22) $8x^2 - 4x - 40$

23) $9m^2 + 30m + 25$

24) $3x^3 + 12x^2 - 15x$

25) $v^4 - w^4$

26) $5a^2 - 10ab + 3a - 6b$

27) $12x^2 - 26x + 10$

Topic 8: Solving Quadratic Equations

Solving Quadratic Equations

1. Make equation = 0
2. Factor it.
3. ZFP it.

ZFP – Zero Factor Property

If $a \cdot b = 0$, then $a = 0$ or $b = 0$.

Solve each equation by factoring.

1) $x^2 - 7x = 0$

2) $(2x - 7)(x + 5) = 0$

3) $x^2 - 3x = 10$

4) $4x^2 - 9 = 0$

5) $2x^2 - x = 10$

6) $y(y - 9) = -14$

Topic 9: Rational Expressions

Simplifying Rational Expressions

1. Factor top, factor bottom (where necessary)
2. Cancel common factors

Multiplying/Dividing* Rational Expressions

1. Factor top, factor bottom (where necessary)
2. Cancel common factors on top and bottom
3. Multiply across top, multiply across bottom

* Division - multiply by reciprocal (flip) before performing step 1

Simplify each rational expression.

1) $\frac{x^2y - 3xy}{x - 3}$

2) $\frac{x^2 - 4x + 4}{x^2 - 5x + 6}$

Multiply or divide as indicated.

3) $\frac{8xy^2}{-6x^2y} \div \frac{2x^3}{3y^3}$

4) $\frac{x - 6}{x^2 - 4x} \cdot \frac{5x}{3x - 18}$

5) $\frac{21}{x^2 - 9} \div \frac{6}{x - 3}$

6) $\frac{2x + 4}{x^2 - 4} \cdot \frac{x^2 + 3x - 10}{12}$

Topic 10: Radicals (Square Roots)

Radical Rules

1. $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$
2. $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$, $b \neq 0$

Simplifying Square Roots

Use radical rule 1. to rewrite using a perfect square

Adding/Subtracting Square Roots

Use radical rule 1. to simplify each square root, then add or subtract as indicated

Multiplying/Dividing Square Roots

Use radical rule 1. and 2. to multiply or divide accordingly, then simplify each square root where possible

Simplify each square root.

1) $\sqrt{\frac{25}{49}}$

2) $\sqrt{81x^6}$

3) $\sqrt{45}$

4) $\sqrt{75mn^8}$

5) $\sqrt{\frac{16a^3}{121}}$

6) $\sqrt{18} - \sqrt{50}$

7) $\sqrt{48} + 3\sqrt{75}$

8) $\sqrt{6}(\sqrt{7} + 4\sqrt{5})$

9) $(5 + \sqrt{6})(3 - \sqrt{6})$

10) Rationalize $\frac{8}{\sqrt{3}}$

Hint: multiply top and bottom by $\sqrt{3}$

Topic 11: Graphing, Slope, System of Two Equations

Finding Intercepts

x-intercept: replace y with 0 and solve for x
y-intercept: replace x with 0 and solve for y

Find the x or y intercept as indicated.

1) $4x + 3y = -9$, y-int

2) $x + 2y = 4$, x-int

3) $y = 2x + 5$, x-int

Graphing a Line

Find the intercepts, plot them on the rectangular coordinate system and draw your line.

Graph each line.

4) $2x - 3y = -6$

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

Finding Slope of a Line

If given two points, use the formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

If given an equation: solve for y to get $y = mx + b$ form - the slope is the **m** value

Find the slope (m).

6) passing through the points:
(2, -3) and (-1, 3)

7) passing through the points:
(5, 0) and (-5, 5)

8) Given the equation:
 $4x + 3y = -9$

9) Given the equation:
 $2y = 6x - 5$

Finding the Equation of a Line

1. Find the slope, m
2. Use the formula $y - y_1 = m(x - x_1)$ with slope, m , and one point (x_1, y_1) to solve for y , giving $y = mx + b$
3. If needed (based on directions) rearrange equation to write it in standard form $Ax + By = C$

Find the equation of each line.

- 10)** passing through the points: $(2, -3)$ and $(-1, 3)$
- 11)** with slope 2 and passes through the point $(2, -2)$

Solving a System of Two Equations - Elimination Method

1. Make sure equations are lined up, if needed, rearrange terms to get them in the form: x 's y 's = **number**
2. Multiply top and bottom equations by the appropriate number to eliminate one variable
3. Add the two new equations and solve the resulting equation
4. Replace the answer obtained from step 3. into one of the original equations and solve for the other variable

Solve each system of equations.

12)
$$\begin{aligned} x + y &= 5 \\ x - y &= 3 \end{aligned}$$

13)
$$\begin{aligned} x + 3y &= 9 \\ 2x + 2y &= -10 \end{aligned}$$

14)
$$\begin{aligned} 2x - 4y &= -10 \\ 3x + 8y &= -1 \end{aligned}$$

15)
$$\begin{aligned} 3x + 4y &= 21 \\ y &= 2x - 3 \end{aligned}$$

Topic 12: Word Problem (Situation)**Guide for Solving Word Situations**

1. Read the situation carefully. Use a diagram where needed to help with understanding the situation.
2. Translate phrases into math – create equation(s)
3. Solve equation and answer.

See keyword guide below in **Additional Math Resources**.

Solve each word situation.

- 1) A 28-ft piece of rope is cut into two pieces such that the second piece is 4 feet less than three times the first piece. Find the length of the second piece.
- 2) Joe scored 78, 90, 68 and 76 on his first four tests. What possible score could he earn on his next test to have an average of **at least** 80?
- 3) It took Marsella 2.5 hours to travel 145 miles; at the same rate, how far will she travel in the next 7 hours?
- 4) A ship started off travelling 40 miles north then 30 miles west. What is the shortest distance from the ship's starting point to its current position?
- 5) The area of a rectangular rug is 96 square feet. If the length of the rug is 4 feet more than its width, find the length and width of this rug.
- 6) Paul wants to invest \$8,000 into two stocks, stock A and stock B, for one year. Stock A earns 7% simple interest and Stock B earns 5%. If Paul wants a \$500 return on his investment, how much should he invest into each stock?

Multiplication Table (Commutative Style)

Multiplication Table (Commutative Style)											
2's											
2×2 4	3's										
2×3 6	3×3 9	4's									
2×4 8	3×4 12	4×4 16	5's								
2×5 10	3×5 15	4×5 20	5×5 25	6's							
2×6 12	3×6 18	4×6 24	5×6 30	6×6 36	7's						
2×7 14	3×7 21	4×7 28	5×7 35	6×7 42	7×7 49	8's					
2×8 16	3×8 24	4×8 32	5×8 40	6×8 48	7×8 56	8×8 64	9's				
2×9 18	3×9 27	4×9 36	5×9 45	6×9 54	7×9 63	8×9 72	9×9 81	10's			
2×10 20	3×10 30	4×10 40	5×10 50	6×10 60	7×10 70	8×10 80	9×10 90	10×10 100	11's		
2×11 22	3×11 33	4×11 44	5×11 55	6×11 66	7×11 77	8×11 88	9×11 99	10×11 110	11×11 121	12's	
2×12 24	3×12 36	4×12 48	5×12 60	6×12 72	7×12 84	8×12 96	9×12 108	10×12 120	11×12 132	12×12 144	

MULTIPLICATION FACTS

- ❖ Each number in multiplication is called a factor
- ❖ Multiplication with 0 equals 0
- ❖ Multiplication with 1 does not change the other value
- ❖ Multiplication is commutative (reversible)
- ❖ Perfect squares: 0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144

Classifying Numbers

Prime: a number with exactly two factors, 1 and itself; the first five prime numbers are: 2, 3, 5, 7, 11

Composite: a number with more than two factors; the first five composite numbers are: 4, 6, 8, 9, 10

Even: a number that can be divided evenly by 2; the first six even numbers are: 0, 2, 4, 6, 8, 10

Odd: a number whose remainder is 1 when divided by 2; the first six odd numbers are: 1, 3, 5, 7, 9, 11

Integers: the group of number consisting of the following: ..., -3, -2, -1, 0, 1, 2, 3, ...

Number Properties

* addition and multiplication only

Commutative (reversible)
 $a + b = b + a$ and $a \cdot b = b \cdot a$

Associative (grouping)
 $(a + b) + c = a + (b + c)$ and $(a \cdot b) \cdot c = a \cdot (b \cdot c)$

Distributive (give out)
 $a(b + c) = ab + ac$ and $(b + c)a = ba + ca$

Two Very Important Numbers

- Zero** is called the additive identity; it can be used to add to any quantity without changing the value of that quantity.
- One** is called the multiplicative identity; it can be used to multiply any quantity without changing the value of that quantity.

Fractions/Mixed Numbers

Simplifying a fraction

KEY: divide out the common factor from both numerator and denominator

Multiplying fractions

KEY: $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$ multiply numerator values / multiply denominator values

Dividing fractions

KEY: $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{a \cdot d}{b \cdot c}$ change division to multiplication and multiply by the reciprocal (flip) fraction, $\frac{d}{c}$

Adding and Subtracting fractions

KEY: need the Lowest Common Denominator (LCD) for all fractions

Mixed number - A number with a whole number part and a fractional part

Converting improper fraction to mixed number

KEY: divide the denominator into the numerator and the remainder represents the fractional part of the mixed number.

Converting mixed number to improper fraction

KEY: multiply the denominator from fractional part by the whole number and add the numerator to get the new numerator of the improper fraction

Multiplying/Dividing Mixed Numbers

KEY: convert mixed numbers into improper fractions and use the rule for multiplying or dividing fractions

Adding/Subtracting Mixed numbers

KEY: add/subtract whole number parts, then add/subtract fractional parts

Decimals

Adding/Subtraction decimals

KEY: line-up decimal places and add or subtract

Multiplying decimals

KEY: sum the numbers of decimal places in each factor, multiply as usual and use the sum of decimal places in answer

Dividing decimals

KEY: must have a whole number divisor – get whole number divisor by multiplying by both divisor and dividend by the appropriate power of 10

Percents

Percent (%): fraction whose denominator is 100

Convert % to decimal or fraction

KEY: divide decimal or fraction by 100

Convert decimal or fraction to %

KEY: multiply decimal or fraction by 100

WORD SITUATION - KEYWORD GUIDE

Addition	Subtraction	Multiplication	Division	Equality	Inequality
add	subtract	multiply	divide	equals	is less than ($<$)
plus	minus	product	divided by	yields	at most (\leq)
more than	difference	times	divided into	gives	no more than (\leq)
added to	subtracted from	of	quotient	is	not exceed (\leq)
sum	less than	twice	into	results in	is greater (more) than ($>$)
total	less		ratio		at least (\geq)
					no less than (\geq)
					must exceed (\geq)

This table gives a good starting guide of helpful keywords that usually appear in word situations.

There are three key words from the list that can be tricky in its translation: **less than**, **subtracted from** and **divided into**. We translate these three keywords opposite to what is written.

Examples:

1. "Twelve **less than** a number" is: $n - 12$
2. "Nine **subtracted from** seven" is: $7 - 9$
3. "Four **divided into** a number" is: $n \div 4$ or $\frac{n}{4}$

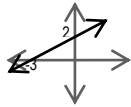
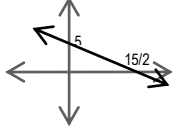
All other keywords on the list can be translated directly as it is written.

Pay careful attention to the word "**and**;" "**and**" should not be quickly interpreted as addition or multiplication; we must first understand keywords that precede or follow the word "**and**."

Examples

1. "The **difference** of six **and** a number" is translated: $6 - n$

2. "When eight **and** a number are **multiplied**" is translated: $8n$

Topic	Answer Key								
Signed Numbers	1) 1	2) -81	3) 81	4) -24	5) -9	6) $\frac{1}{6}$	7) $-\frac{3}{4}$	8) $\frac{3}{10}$	
	9) -3.78	10) $-\frac{7}{15}$	11) -11.69	12) -9	13) $\frac{8}{27}$	14) 9	15) -0.81	16) 5.2	
Order of Operations	1) -20	2) 1	3) $\frac{1}{8}$	4) -79	5) 9	6) 108			
Evaluating Algebraic Expressions and Formulas	1) -6	2) 120	3) -5.5	4) $9x - 11$	5) $-2m - 8$	6) 6	7) $P = 38$	8) $A = 35$	9) $D = 81$
Solving Equations, Formulas, Inequalities & Proportions	1) $x = -2$	2) $y = \frac{2}{9}$	3) $y = 15$	4) $y = 23$	5) $x = \frac{2}{7}$	6) $x = 7$	7) $x = 7$	8) $x = -2.75$	9) $\frac{P-2I}{2} = w$ or $\frac{P}{2} - I = w$
	10) $y = \frac{C - Ax}{B}$	11) $\frac{I}{rt} = P$	12) $3S - a - c = b$	13) $x < 4$	14) $x \leq 2$	15) $x > -3$	16) $x \leq -\frac{5}{2}$	17) $\frac{14}{3}$	18) 12
	19) 5								
Exponent Rules & Scientific Notation	1) x^6y	2) $16x^4y^{24}$	3) x^6y^{13}	4) $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$	5) $\frac{b^{17}}{a^8}$	6) $-\frac{x^2}{2y^2}$	7) $\frac{1}{9m^4n^2}$	8) $\frac{x^{18}}{27y^3}$	9) $\frac{x^{16}}{y^{13}}$
	10) 9.3×10^7	11) 3.68×10^{-5}	12) 8×10^{-7}						
Polynomials	1) $x^2y + 3xy + y^2 + 3$	2) $3x^2 - 8x - 2$	3) $-3x^5 + 15x^3 - 6x^2$	4) $y^2 - 4y - 32$	5) $9x^2 - 25$	6) $8n^2 - 2n - 15$			
	7) $16x^2 - 24x + 9$	8) $x^4 + 3x^2 - 18$	9) $m^3 + 4m - 1$	10) $3x^2 - 2x + 4$	11) $4x^3 - 3x^2 + \frac{1}{2}$				
Factoring	1) $3x^2(x^3 - 5x + 1)$	2) $xy(y + 6x - 8)$	3) $2(2y^3 - 3y^2 - 4y - 1)$	4) $(x + 5)(x - 5)$	5) $(2m - 7n)(2m + 7n)$	6) $(c^3 + 6)(c^3 - 6)$			
	7) $(x + 3)(x - 5)$	8) $(x - 6)(x - 4)$	9) $(y - 2)(y + 15)$	10) $(x + 1)(2x + 3)$	11) $(n - 3)(3n + 2)$	12) $(4x - 3)(2x - 1)$			
	13) $(2x + 5)^2$	14) $(3y - 4)^2$	15) $(2m + 7n)^2$	16) $(x + 3)(x^2 + 5)$	17) $(2n - 1)(2n^2 + 3)$	18) $(x - 3)(3x^2 - 1)$			
	19) $6x^2(2 - 3x^2)$	20) $b(b + 7)(b - 7)$	21) $5(x - 6)(x + 1)$	22) $4(2x - 5)(x + 2)$	23) $(3m + 5)^2$	24) $3x(x + 5)(x - 1)$			
	25) $(v^2 + w^2)(v + w)(v - w)$		26) $(a - 2b)(5a + 3)$	27) $2(3x - 5)(2x - 1)$					
Solving Quadratic Equations	1) $x = 0$ or $x = 7$	2) $x = -5$ or $x = \frac{7}{2}$	3) $x = 5$ or $x = -2$	4) $x = \pm \frac{3}{2}$	5) $x = -2$ or $x = \frac{5}{2}$	6) $y = 2$ or $y = 7$			
Rational Expressions	1) xy	2) $\frac{x - 2}{x - 3}$	3) $-\frac{2y^4}{x^4}$	4) $\frac{5}{3x - 12}$	5) $\frac{7}{2x + 6}$	6) $\frac{x + 5}{6}$			
Radicals (Square Roots)	1) $\frac{5}{7}$	2) $9x^3$	3) $3\sqrt{5}$	4) $5n^4\sqrt{3m}$	5) $\frac{4a\sqrt{a}}{11}$	6) $-2\sqrt{2}$	7) $19\sqrt{3}$	8) $\sqrt{42} + 4\sqrt{30}$	9) $9 - 2\sqrt{6}$
	10) $\frac{8\sqrt{3}}{3}$								
Graphing and Slope	1) $(0, -3)$	2) $(4, 0)$	3) $(-\frac{5}{2}, 0)$	4) 	5) 	6) -2	7) $-\frac{1}{2}$	8) $-\frac{4}{3}$	
	9) $m = 3$	10) $y = -2x + 1$	11) $y = 2x - 6$						
	12) $(4, 1)$	13) $(-12, 7)$	14) $(-3, 1)$	15) $(3, 3)$					
Word Problem (Situation)	1) 20 feet	2) Score ≥ 88	3) 406 miles	4) 50 miles	5) 12 ft x 8 ft	6) Paul should invest \$5000 in stock A and \$3000 in stock B.			

PREPARED BY: PERT Math Readiness

NOTE TO STUDENT: The intent of this PERT Math Practice Guide is to help students review and refresh forgotten math skills necessary to take or retake the math section for the Florida PERT test. Due to the condensed nature of this guide, we provided only one method to solving these types of math exercises. Neither the preparer nor editor is responsible or liable for the use/misuse of the information provided in this guide.

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