

Factoring and Applications Lesson #8: Practice Test

1. One factor of $4x^2 - 25y^2$ is

- A. $4x - 25y$ B. $4x - 5y$
C. $2x - 25y$ **D. $2x - 5y$**

$$4x^2 - 25y^2 = (2x - 5y)(2x + 5y)$$

2. One factor of $6x^2 - 5x - 4$ is

- A. $2x - 1$ **B. $3x - 4$**
C. $6x - 1$ D. $3x + 4$

$$\begin{aligned} &= 6x^2 - 8x + 3x - 4 \\ &= 2x(3x - 4) + 1(3x - 4) \\ &= (3x - 4)(2x + 1) \end{aligned}$$

3. When factored, the trinomials $x^2 - 8xy + 15y^2$ and $x^2 - 2xy - 15y^2$ have one binomial factor in common. This factor is

- A. $x - 5y$** B. $x + 3y$
C. $x - 3y$ D. $x + 5y$

$$= (x - 3y)(x - 5y) \quad = (x - 5y)(x + 3y)$$

Numerical Response 1.

The expression $15x^2 + 14x - 8$ can be written in the form $(ax - b)(cx + d)$ where $a, b, c,$ and d are all positive integers.

Write the value of a in the first box. Write the value of b in the second box.
Write the value of c in the third box. Write the value of d in the fourth box.

(Record your answer in the numerical response box from left to right.)

5	2	3	4
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$$\begin{aligned} &15x^2 - 6x + 20x - 8 \\ &= 3x(5x - 2) + 4(5x - 2) \\ &= (5x - 2)(3x + 4) \end{aligned} \quad \begin{aligned} a &= 5 & b &= 2 \\ c &= 3 & d &= 4 \end{aligned}$$

Numerical Response 2.

Consider the trinomial $4a^2 + kab + 49b^2$, where k is a natural number.

In order for $4a^2 + kab + 49b^2$ to represent a perfect square trinomial, the value of k must be _____.

(Record your answer in the numerical response box from left to right.)

2	8		
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$$\begin{aligned} (2a + 7b)^2 &= 4a^2 + 28ab + 49b^2 \\ k &= 28 \end{aligned}$$

4. Which of the following is a factor of $4x^2 - 144y^2$?

- A. $2x + 72y$ **C.** $x + 6y$ $= 4(x^2 - 36y^2)$
 B. $2x - 36y$ D. $x - 18y$ $= 4(x - 6y)(x + 6y)$

5. Which of the following is not a factor of $a^4 - 13a^2 + 36$?

- A.** $a + 9$ C. $a + 2$ $= (a^2 - 4)(a^2 - 9)$
 B. $a - 2$ D. $a - 3$ $= (a - 2)(a + 2)(a - 3)(a + 3)$

6. The equation $25x^2 - 9 = 0$ is satisfied by

- A. $x = \frac{5}{3}$ only B. $x = \frac{3}{5}$ only $25x^2 - 9 = 0$
 C. $x = \pm \frac{5}{3}$ **D.** $x = \pm \frac{3}{5}$ $(5x - 3)(5x + 3) = 0$
 $x = \pm \frac{3}{5}$

7. Consider the following expressions:

1: $4x^2 - 36xy + 81y^2$ # 2: $10x^2 + 43xy - 9y^2$ # 3: $8x^4y^2 - 162x^2y^4$

Which of these expressions has $2x + 9y$ as one of its factors?

- A. # 2 only B. # 3 only C. # 1 and # 2 only **D.** # 2 and # 3 only

#1: $= (2x - 9y)^2$ #2: $= 10x^2 - 2xy + 45xy - 9y^2$ #3: $= 2xy^2(4x^2 - 81y^2)$
 $= 2x(5x - y) + 9y(5x - y)$ $= 2xy^2(2x - 9y)(2x + 9y)$
 $= (5x - y)(2x + 9y)$

8. The solution to the equation $6x^2 - 18x = 0$ is

- A. $x = 3$ only **C.** $x = 0, 3$ $6x(x - 3) = 0$
 B. $x = -3$ only D. $x = -3, 0$ $x = 0$ or $x = 3$
 $x = 0, 3$

9. The solution to the equation $1 + 4x - 21x^2 = 0$ is

A. $-\frac{1}{3}, \frac{1}{7}$ $1 - 3x + 7x - 21x^2 = 0$
 $1(1 - 3x) + 7x(1 - 3x) = 0$

B. $-\frac{1}{7}, \frac{1}{3}$ $(1 - 3x)(1 + 7x) = 0$
 $x = \frac{1}{3}$ or $x = -\frac{1}{7}$

C. $-3, 7$

D. $-7, 3$ $x = -\frac{1}{7}, \frac{1}{3}$

10. The factored form of $p^2 - (q - r)^2$ is

A. $(p - q - r)(p + q + r) = (p - (q - r))(p + (q - r))$

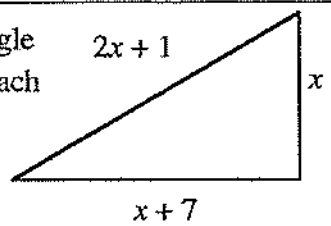
B. $(p - q - r)(p + q - r) = (p - q + r)(p + q - r)$

C. $(p - q + r)(p + q - r)$

D. $(p - q + r)(p + q + r)$

Use the following information to answer the next question.

Consider the right-angled triangle shown in which the length of each side is a whole number.



- Numerical Response** 3. The length of the hypotenuse is _____.

(Record your answer in the numerical response box from left to right.)

1	7		
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$$(2x+1)^2 = x^2 + (x+7)^2$$

$$4x^2 + 4x + 1 = x^2 + x^2 + 14x + 49$$

$$2x^2 - 10x - 48 = 0$$

$$2(x^2 - 5x - 24) = 0$$

$$2(x-8)(x+3) = 0$$

$$x = 8 \text{ or } x = -3$$

reject since $x > 0$

$$x = 8$$

$$\text{hypotenuse} = 2(8) + 1 = 17$$

11. Which one of the following is a factor of $4(3x+1)^2 - 9(x+2)^2$?

A. $3x - 14$ $A = 3x + 1$ $= 4A^2 - 9B^2 = (2A - 3B)(2A + 3B)$

B. $3x + 8$ $B = x + 2$ $= (2(3x+1) - 3(x+2))(2(3x+1) + 3(x+2))$

C. $9x + 8$ $= (6x+2-3x-6)(6x+2+3x+6)$

D. $21x + 22$ $= (3x-4)(9x+8)$

Use the following information to answer the next question.

Chantelle is asked to factor the expression $4x^2 - 16xy + 16y^2$. Part of her work is shown below.

$$4x^2 - 16xy + 16y^2 = (2x - 4y)(2x - 4y) \quad \text{Line 1}$$

$$= (2x - 4y)^2 \quad \text{Line 2}$$

$$= 2(x - 2y)^2 \quad \text{Line 3}$$

12. A. Answer A if her work is correct.
 B. Answer B if her first mathematical error is in Line 1.
 C. Answer C if her first mathematical error is in Line 2.
 (D) Answer D if her first mathematical error is in Line 3.

Line 3
 $(2x - 4y)^2$
 $= [2(x - 2y)]^2$
 $= 4(x - 2y)^2$

Numerical Response

4. The expression $8(2a + 3)^2 + 14(2a + 3) + 3$ can be written in factored form as $(4a + K)(8a + L)$. The value of the product KL is _____.

(Record your answer in the numerical response box from left to right.)

1	1	7
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Let $P = 2a + 3$

$$8P^2 + 14P + 3 = (4a + 9)(8a + 13)$$

$$= 8P^2 + 12P + 2P + 3 \quad K = 9 \quad L = 13$$

$$= 4P(2P + 3) + 1(2P + 3)$$

$$= (2P + 3)(4P + 1)$$

$$= (2(2a + 3) + 3)(4(2a + 3) + 1)$$

$$= (4a + 6 + 3)(8a + 12 + 1)$$

$$KL = (9)(13) = 117$$

13. The extraneous root in the radical equation $x - 3 = \sqrt{30 - 2x}$ is

- A. 7 $(x - 3)^2 = (\sqrt{30 - 2x})^2$ verify $x = -3$ $LS \neq RS$
- B. 3 $x^2 - 6x + 9 = 30 - 2x$ $LS = -3 - 3 = -6$
- (C) -3 $x^2 - 4x - 21 = 0$ $RS = \sqrt{30 - 2(-3)} = \sqrt{36} = 6$
- D. -7 $(x + 3)(x - 7) = 0$ verify $x = 7$ $LS = RS$
- $x = -3, 7$ $LS = 7 - 3 = 4$ $RS = \sqrt{30 - 2(7)} = \sqrt{16} = 4$

14. The equation $12t^2 + 17t - 5 = 0$ is satisfied by $t = a$ and by $t = -b$, where $a, b > 0$. The value of a is

(A) $\frac{1}{4}$ $12t^2 - 3t + 20t - 5 = 0$
 $3t(4t-1) + 5(4t-1) = 0$

B. $\frac{3}{5}$ $(4t-1)(3t+5) = 0$
 $t = \frac{1}{4}$ or $t = -\frac{5}{3}$

C. $\frac{5}{3}$

D. 4 $a = \frac{1}{4}$

Use the following information to answer the next two questions.

The Kinetic Energy (KE) of a moving object in joules is related to the mass, m , in kilograms, and velocity, v , in m/s, of the object and is given by the formula $v = \sqrt{\frac{2(KE)}{m}}$.

Numerical Response

5. Jordin has a summer job arranged by the BC First Nations Forestry Council. He is working with a driver of a logging truck transporting logs to the local lumber mill. In kilojoules, the kinetic energy of the logging truck with a mass of 15 000 kg travelling at 10 m/s is _____.

(Record your answer in the numerical response box from left to right.)

$$v = \sqrt{\frac{2(KE)}{m}} \quad 100 = \frac{2(KE)}{15000}$$

$$10 = \sqrt{\frac{2(KE)}{15000}} \quad 150000 = 2(KE)$$

$$10^2 = \frac{2(KE)}{15000} \quad KE = 750000 \text{ joules} = 750 \text{ kilojoules}$$

15. The distance, d metres, travelled by an object with initial velocity v m/s and acceleration a m/s², is given by the formula $d = vt + \frac{1}{2}at^2$. In factored form, it can be written in the

form $d = \frac{1}{2}t(Mv + Nat)$ where M and N are integers. The value $\frac{M}{N}$ is

A. $\frac{1}{4}$ B. $\frac{1}{2}$ $d = vt + \frac{1}{2}at^2$
 $= \frac{1}{2}t(2v + at)$

(C) 2 D. 4 $M = 2 \quad N = 1$ $\frac{M}{N} = \frac{2}{1} = 2$

Written Response - 5 marks

1. To check to see if Jason has understood his radicals homework, his mother gave him a challenge.

“If you can answer this question correctly, you will have no chores to do this weekend. I am thinking of a number. I multiply the number by 7, subtract 10, and take the square root of the result. The answer I get is 4 less than the original number. What is the number?”

- Denoting the number by n , write a radical equation to represent this scenario.

$$\sqrt{7n-10} = n-4$$

- Determine the restrictions on the value of the variable n .

$$\begin{aligned} 7n-10 &\geq 0 \\ 7n &\geq 10 & n &\geq \frac{10}{7} \end{aligned}$$

- Explain why, in the process of solving this radical equation algebraically, an extraneous root may appear.

The solution process involves squaring both sides of the equation and solving. However, if the squares of two quantities are equal, it does not necessarily mean that the two quantities are equal.

An extraneous root may appear.

- Algebraically, determine the solution to the radical equation, and state the number in the scenario.

$$\begin{aligned} \sqrt{7n-10} &= n-4 \\ 7n-10 &= (n-4)^2 \\ 7n-10 &= n^2-8n+16 \\ 0 &= n^2-15n+26 \\ 0 &= (n-2)(n-13) \end{aligned}$$

$$n = 2, 13$$

verify $n = 2$

$$\begin{aligned} \text{LS} &= \sqrt{7(2)-10} = \sqrt{4} = 2 \\ \text{RS} &= 2-4 = -2 \end{aligned} \quad \text{LS} \neq \text{RS}$$

verify $n = 13$

$$\begin{aligned} \text{LS} &= \sqrt{7(13)-10} = \sqrt{81} = 9 \\ \text{RS} &= 13-4 = 9 \end{aligned} \quad \text{LS} = \text{RS}$$

The number is 13

Answer Key

1. D 2. B 3. A 4. C 5. A 6. D 7. D 8. C
9. B 10. C 11. C 12. D 13. C 14. A 15. C

Numerical Response

1.

5	2	3	4
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2.

2	8		
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3.

1	7		
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4.

1	1	7	
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5.

7	5	0	
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Written Response

1. • $\sqrt{7n-10} = n-4$ • $n \geq \frac{10}{7}$

- The solution process involves squaring both sides of the equation and solving. However, if the squares of two quantities are equal, it does not necessarily mean that the two quantities are equal. An extraneous root may appear.

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