

PROU

practice




Key

Polys Unit  
Final.

## Foundations of Mathematics and Pre-Calculus 10

Sample Questions for  
Algebra and Number

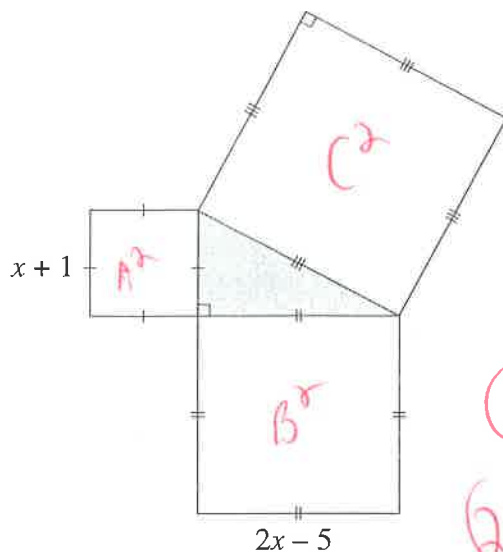
### Instructions

1. You may require a protractor and a ruler (metric and imperial) for paper versions of the questions.
2. You may use math tiles.
3. When using your calculator (scientific or approved graphing calculator):
  - use the programmed value of  $\pi$  rather than the approximation of 3.14.
  - round only in the final step of the solution.
4. Diagrams are not necessarily drawn to scale.
5. For questions marked with , do not use your calculator.

Circled Questions



8. Determine an expression for the area of the largest square in the diagram below.



Area  
 $C^2 = A^2 + B^2$

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

$$+ (2x-5)(2x-5) = 4x^2 - 20x + 25$$


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$$5x^2 - 18x + 26$$

- A.  $4x^2 + 25$
- B.  $4x^2 - 20x + 25$
- C.  $5x^2 + 26$
- D.  $5x^2 - 18x + 26$

9. Derek expanded and simplified  $(x-3)(2x^2+5x-8)$  as shown below.

	$x$	$-3$	
$2x^2$	$2x^3$	$-6x^2$	Step I
$+ 5x$	$5x^2$	$-15x$	Step II
$- 8$	$-8x$	$-24$	Step III
$= 2x^3 - x^2 - 23x - 24$			Step IV

In which step is Derek's first mistake?

- A. Step I
- B. Step II
- C. Step III
- D. Step IV

10. When  $5x^2 - 20$  is factored, how many factors are in the result?

- A. 2
- B. 3
- C. 4
- D. 5

$\downarrow$  diff. of square  
 $\hookrightarrow (x^2 - 4)$        $\hookrightarrow (x-2)(x+2)$

11. One of the factors of  $(3x^2 - 16x + k)$  is  $(x - 7)$ . Determine the value of  $k$ .

- A. -35
- B. -9
- C. 5
- D. 63

$(x-7)(3x+5) = (3x^2 - 16x + k)$

Only way to get  $3x^2$  is  $x \cdot 3x$

So  $-7 \times 3x = -21x$  we need  $-16x$  so have to

add  $5x$  so  $k = -35$

12. When factoring  $x^2 - 7x + 6$  to the form  $(x + a)(x + b)$ , which two of the following characteristics are true?

I.	$ab = -7$ $a + b = 6$
II.	$ab = 6$ $a + b = -7$
III.	$a > 0$ and $b > 0$
IV.	$a < 0$ and $b < 0$
V.	$a > 0, b < 0$ or $a < 0, b > 0$

- A. I and III
- B. I and IV
- C. II and IV
- D. II and V

$(x^2 - 7x + 6) = (x - 6)(x - 1)$

So  $ab = 6$     $a + b = -7$

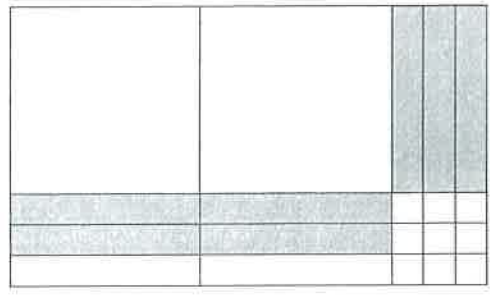
$a = -6$     $b = -1$

$a < 0$     $b < 0$

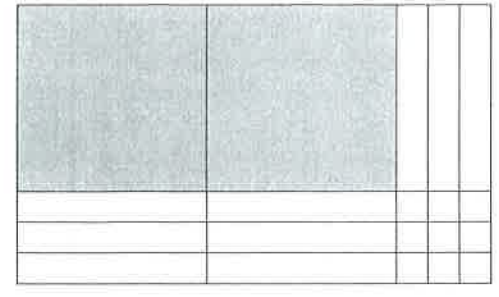
13.

Which of the following areas formed by math tiles is factorable?

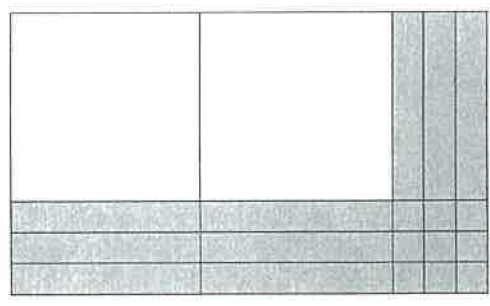
A.  $AC = \frac{18}{11} = -6$  NO  
 $2x^2 - 6x + 9x$



B.  $AC = \frac{18}{11} = 9$  NO  
 $-2x^2 + 9x - 9$

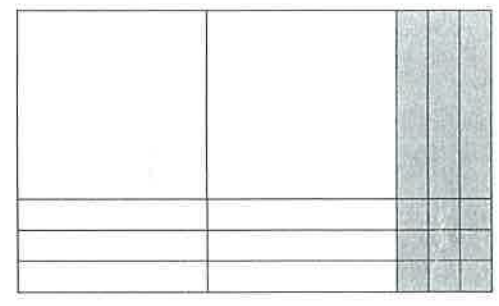


C.  $2x^2 - 9x - 9$



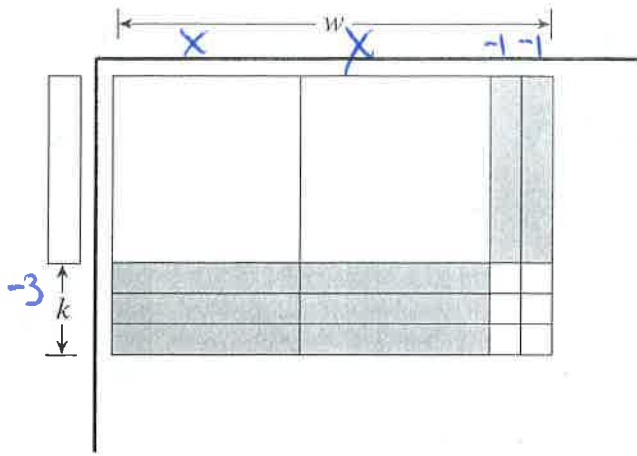
$AC = -18$   
 $\begin{array}{l} / \\ + \end{array} = -9$   
 NO





D.  $2x^2 + 3x - 9$



$AC = -18$   
 $\begin{array}{l} / \\ + \end{array} = 3$   
 Yes

14. Determine the missing tiles, labelled  $w$ , in the tile model below.



- A. 
- B.** 
- C. 
- D. 

37. A research assistant calculated the brain mass,  $b$ , of an 8 kg cat. She used the formula  $b = 0.01m^{\frac{2}{3}}$ , where  $m$  is the total mass of the cat.

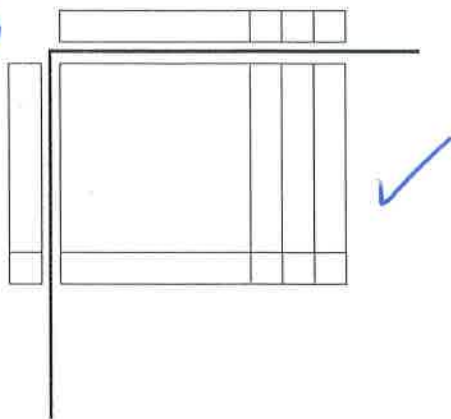
Steps	
I.	$b = 0.01\sqrt[3]{8^2}$
II.	$b = 0.01\sqrt[3]{16}$
III.	$b \approx 0.01(2.52)$
IV.	$b \approx 0.025$

In which step did the research assistant first make a mistake?

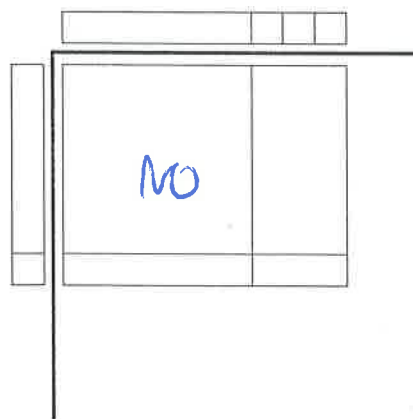
- A. Step I
- B. Step II
- C. Step III
- D. Step IV

38. Which of the following diagrams best represents the expansion of  $(x+3)(x+1)$  pictorially?

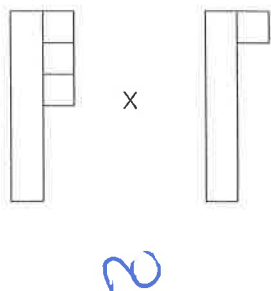
A.



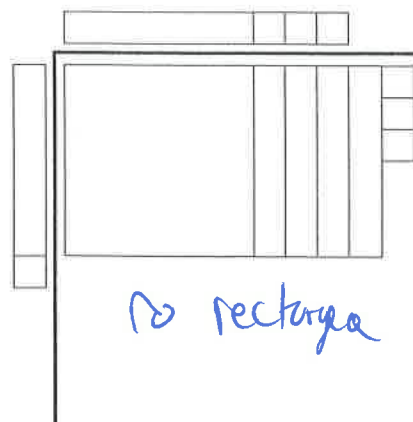
B.



C.



D.



$$= x^2 + 4x + 3$$

39. Expand and simplify:  $(x-4)^3$

- A.  $x^3 - 12x^2 + 48x - 64$
- B.  $x^3 + 12x^2 + 48x + 64$
- C.  $x^3 - 4x^2 + 16x + 64$
- D.  $x^3 - 64$

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

$$= x^3 - 4x^2 - 8x^2 + 32x + 16x - 64$$

$$= x^3 - 12x^2 + 48x - 64$$

40. Katie simplified the expression  $(x+b)(x+c)$ , where  $b < 0$  and  $c < 0$ , to the form  $x^2 + gx + k$ . What must be true about  $g$  and  $k$ ?

- A.  $g < 0$  and  $k > 0$
- B.  $g < 0$  and  $k < 0$
- C.  $g > 0$  and  $k > 0$
- D.  $g > 0$  and  $k < 0$

Use actual #s  $b < 0$  and  $c < 0$   
 $b = -2$   
 $c = -6$

$$(x-2)(x-6) = x^2 - 8x + 12$$

$\uparrow$        $\uparrow$   
 $g$        $k$   
 $g < 0$        $k > 0$

41. Factor:  $y^2 - 81$  diff of squares

- A.  $(y-9)^2$
- B.  $(y+9)^2$
- C.  $(y+9)(y-9)$
- D.  $(y+3)(y-3)(y+9)$

$$(y-9)(y+9)$$

42. Which of the following expressions have a factor of  $x+2$ ?

I.	$x^2 - 4$
II.	$2x^2 - x - 10$
III.	$5x + 10$

$$(x-2)(x+2)$$

$$2 \cdot 10 = -20$$

$$\begin{matrix} & -5 & 4 & = -1 \\ & \swarrow & \searrow & \\ & -5 & 4 & \end{matrix}$$

$$\frac{(2x^2 - 5x)(4x - 10)}{x \cdot 2}$$

$$(x+2)(2x-5)$$

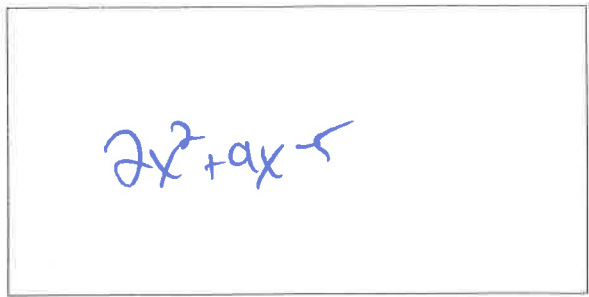
- A. I only
- B. III only
- C. I and III only
- D. I, II and III



*A Peter*

43.

Given that the area of the rectangle below is  $2x^2 + 9x - 5$ , determine the length of the rectangle.



$x + 5$

length

- A.  $2x - 1$
- B.  $2x + 1$
- C.  $2x + 9$
- D.  $2x^2 + 8x - 10$

$$2 - 5 = -10$$

$$\quad \quad \quad \wedge$$

$$10 + 9 = 9$$

$$\frac{(2x^2 + 10x)(-1)(x - 5)}{2x \quad -1}$$

$$2x(x + 5) - 1(x + 5)$$

44. As an estimation strategy, what could be used to best approximate one centimetre?

$$(2x - 1)(x + 5)$$

- A. the length of your foot
- B. the width of your hand
- C. the width of your finger
- D. the width of a pencil lead

57. A package of 12 hex bolts and 10 anchor bolts weighs 7 pounds. A second package of 5 hex bolts and 15 anchor bolts weighs 4 pounds. How much does a single hex bolt weigh? Answer in pounds to one decimal place.

Record your answer neatly on the Answer Sheet.

58. How many integer values are there for  $k$  for which  $4x^2 + kxy - 9y^2$  is factorable?

Record your answer neatly on the Answer Sheet.

$$Ac = \begin{array}{c} -36 \\ / \quad \backslash \\ + \quad = k \end{array}$$

So need factors of  $-36$

$$\begin{array}{ll} 1, -36 = \underline{-36} & -1, 36 = \underline{36} \\ 2, -18 = \underline{-18} & -2, 18 = \underline{18} \\ 3, -12 = \underline{-12} & -3, 12 = \underline{12} \\ 4, -9 = \underline{-9} & -4, 9 = \underline{9} \\ 6, -6 = \underline{-6} & \end{array}$$

9 values

4. How many solutions does this system of equations have?

$$y = 3x + 7$$

$$y = 3x - 4$$

- A. no solution
- B. one solution
- C. an infinite number of solutions
- D. cannot be determined without solving

5. What is the least common multiple of 18 and 24?

- A.  $2 \times 3 = 6$
- B.  $2^2 \times 3^3 = 36$  **108**
- C.  $2^3 \times 3^2 = 72$
- D.  $2^4 \times 3^3 = 432$

Handwritten work for question 5:

18, 26, 54, 72  
24, 48, 72

or

18:  $2 \times 3 \times 3$   
24:  $2 \times 2 \times 2 \times 3$

LCM:  $2^3 \times 3^2 = 72$

6. What is the greatest common factor of 12, 24, 30, 72?

- A. 360
- B. 12
- C. 6
- D. 2

Handwritten work for question 6:

Start at 12 then check above  
12 = 1, 2, 3, 4, 6, 12

7. Express  $2\sqrt{5}$  as an entire radical.

- A.  $\sqrt{10}$
- B.  $\sqrt{20}$
- C.  $\sqrt{50}$
- D.  $\sqrt{100}$

37. Simplify:  $\sqrt{x^3} \div \sqrt[3]{x^4}$

- A.  $\sqrt[6]{x}$
- B.  $\sqrt[8]{x^9}$
- C.  $\sqrt[9]{x^8}$
- D.  $\sqrt[12]{x}$

38. Expand and simplify:  $(4x - 3)^2$

- A.  $16x^2 + 9$
- B.  $16x^2 - 12x + 9$
- C.  $16x^2 - 24x - 9$
- D.  $16x^2 - 24x + 9$

$(4x-3)(4x-3)$        $16x^2 - 12x - 12x + 9$

$16x^2 - 24x + 9$

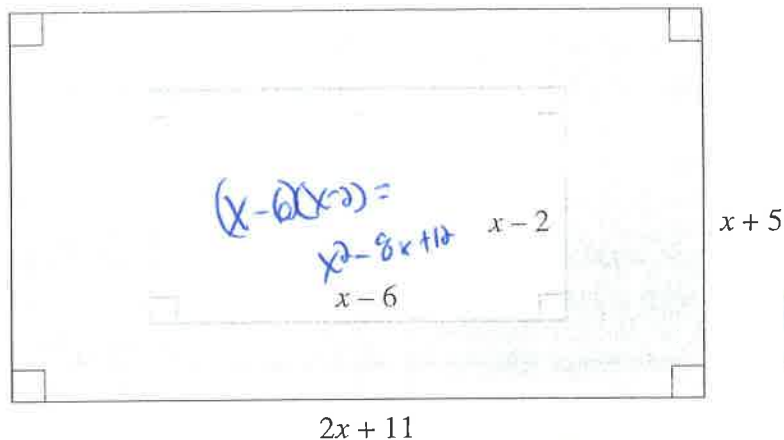
39. Pam expanded and simplified  $(x - 3)(x^2 + 2x - 4)$ , as shown below.

Steps	
I.	$x(x^2 + 2x - 4) - 3(x^2 + 2x - 4)$ ✓
II.	$x^3 + 2x^2 - 4x - 3x^2 + 6x + 12$ ✓ ✓ ✓ ✓ $-6x + 12$
III.	$x^3 - x^2 + 2x - 12$

In which step is Pam's first error?

- A. Step I
- B. Step II
- C. Step III
- D. There is no mistake.

40. Determine an expression to represent the shaded area below.



Big - Small

$$(2x+11)(x+5) - (x^2 - 8x + 12)$$


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$$x^2 + 29x + 43$$

- A.  $x^2 + 43$
- B.  $x^2 + 13x + 67$
- C.  $x^2 + 29x + 43$
- D.  $3x^2 + 13x + 67$

41. Determine the greatest common factor of  $12x^5y$ ,  $4x^3y^2$  and  $6x^2y^4$ .

- A.  $2xy$
- B.  $2x^2y$
- C.  $4x^3y^2$
- D.  $12x^5y^4$

Handwritten work for Q41:

$$|2, 4, 6| = 2$$

$$x^5, x^3, x^2 = x^2$$

$$y, y^2, y^4 = y$$

Result:  $2x^2y$

42. Which of the following expressions is a factor of  $x^2 - 8x - 20$ ?

- A.  $x - 2$
- B.  $x - 4$
- C.  $x - 5$
- D.  $x - 10$

$$(x-10)(x+2)$$

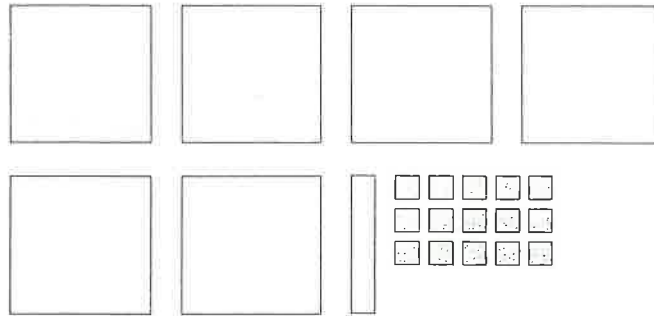
43. When completely factored, how many factors does  $2x^4 - 24x^2 - 128$  have?

- A. 2
- B. 3
- C. 4
- D. 5









$4$  as degree =  $4$

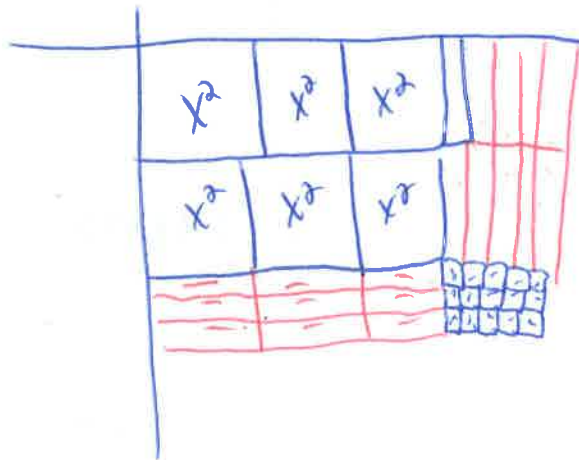
$+1$  as  $2, 24, 128$  can be reduce

44. Joe was asked to factor  $6x^2 + x - 15$  and represent it with math tiles.



What additional tiles would he need to represent the total area of the two factors?

- A. 8 each of  and 
- B. 9 each of  and 
- C. 10 each of  and 
- D. 11 each of  and 



Need in Red  
Need -9 and +9