16. A polynomial is shown below.

$$x^2 + 2x + (-24)$$

A. Factor the polynomial.

$x^2+2x-24$

24
1·24
2·12
3·8
4·6

$6-4=2$

$(x+6)(x-4)$

B. Explain why the polynomial is **not** the difference of squares.

A difference of 2 squares is a binomial, not a trinomial. 24 is not a perfect square.

C. Use one of your factors from **Part A** to write a polynomial that is the difference of squares.

$(x+6)(x-6)$ or $(x+4)(x-4)$

$x^2 - 6x + 6x - 36$ $\qquad$ $x^2 - 4x + 4x - 16$

x^2-36 or x^2-16

Constructed Response

A. Add and simplify: $(6x^2 - x + 8) + (3x - 4)$

$6x^2 + 2x + 4$

$6x^2 + 2x + 4$

B. Multiply and simplify: $(x - 2)(4x^2 + 3x - 2)$. Show your work and write your answer in descending order.

$$\begin{array}{r} 4x^3 + 3x^2 - 2x \\ -8x^2 - 6x + 4 \\ \hline 4x^3 - 5x^2 - 8x + 4 \end{array}$$

$4x^3 - 5x^2 - 8x + 4$

C. Error Analysis: Describe and correct the error made in factoring the equation below.

$175x^2 - 28 = 7(25x^2 - 4)$

$7(5x - 2)(5x - 2)$

$7(5x - 2)^2$

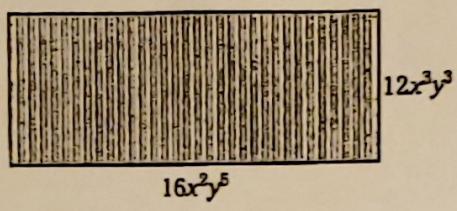
What was incorrect? Why was it incorrect? How do you correct it?

A difference of 2 squares should have a positive & negative binomial factor.

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

Read the problem. Write your answer for each part.

4. An engineer is designing a solar panel in the shape of a rectangle. The length and width are described by monomials, as shown in the diagram.



A Write an expression in simplest terms for the area of the rectangle.

$16x^2y^5(12x^3y^3)$

$= 192x^5y^8$

Answer: _____

B If $x = 2$ and $y = \frac{1}{2}$, what is the area of the rectangle? Show all your work.

$192(2)^5\left(\frac{1}{2}\right)^8$

$192(32)\left(\frac{1}{256}\right) = 24$

Answer: 24

Read the problem. Write your answer for each part.

5. The following expressions all use the same values for n, p, and q.
   - $3^2 \cdot 3^n$ simplifies to 3^{20}.
   - $\frac{7^n}{7^5}$ simplifies to 7^p.
   - $(4^p \cdot 4^1)^3$ simplifies to 4^q.

A What is the value of the exponent n?

$$3^2 \cdot 3^n = 3^{2+n} = 3^{20}$$

$$2+n = 20$$
$$-2 \quad -2$$
$$n = 18$$

Answer: 18

B What is the value of the exponent p?

$$\frac{7^{18}}{7^5} = 7^{18-5} = 7^{13} = p$$

Answer: 13

C What is the value of the exponent q?

$$(4^p \cdot 4^1)^3 = (4^{13} \cdot 4^1)^3$$
$$= (4^{14})^3 = 4^{42}$$

$42 = 8$

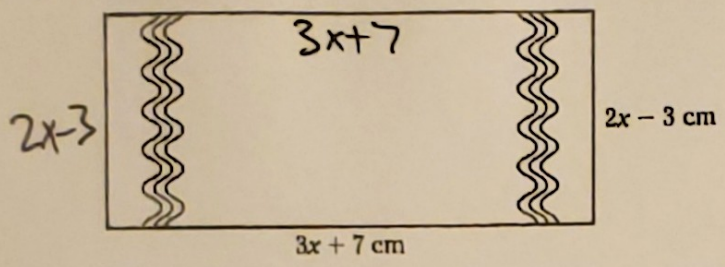
Answer: 42

D Explain how you found your answers.

I applied rules for exponents.
Part A, add exponents when multiply expression with same base.
Part B, subtract exponents when dividing expression with same base.
Part C, multiply exponents when raising a power to a power.

Read the problem. Write your answer for each part.

3. A manufacturer makes rectangular blankets in several styles and sizes. The outline of a popular blanket in size A is shown below.



A Write a polynomial expression, in simplified form, that represents the perimeter of the blanket.

Add sides

$(2x-3)+(2x-3)+(3x+7)+(3x+7)$

$10x+8$

Answer: $10x+8$

B Write a polynomial expression, in simplified form, that represents the area of the blanket.

Multiply

$(3x+7)(2x-3)$

$6x^2-9x+14x-21$

$5x$

Answer: $6x^2+5x-21$

C The same style blanket in size B has width $2x + 10$ and length $4x - 10$.

Write a polynomial expression, in simplified form, that expresses the difference in area of the blankets A and B. Show all your work.

$(2x+10)(4x-10)$

$8x^2-20x+40x-100$

$8x^2+20x-100$

From Part B ↓

$6x^2+5x-21 \pm (8x^2+20x-100)$

Answer: $-2x^2-15x+79$

Read the problem. Write your answer for each part.

4. A physicist needs to know the values of x for which the trinomial below equals zero. Her first step is to factor the trinomial.

$$x^2 + 10x + 24$$

A Factor the trinomial.

4+6

24
1·24
2·12
3·8
4·6

Answer: $(x+4)(x+6)$

B Explain how you found your answer to **part A.**

Factors of 24 [4·6] that add to 10 [4+6=10].

C The physicist also needs to factor the trinomial below.

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

What is the factored form of the trinomial?

$(x-6)(x-4)$

Answer: $(x-6)(x-4)$

D The physicist must factor several trinomials that are all of the form $x^2 - mx + n$, where m and n are whole numbers greater than zero. She wonders if any of these trinomials factor as $(x + a)(x + b)$, where $a > 0$ and $b < 0$. Is that possible? Explain why or why not.

A B C

$x^2 - mx + n$

Since C is positive and B is negative, the factors of each binomial need to be negative $(x-a)(x-b)$ where $a>0$ $b>0$.

She cannot have factors in the form she imagined because one would be positive.

Read the problem. Write your answer for each part.

5. A manufacturing company uses the expressions below to estimate revenue and expenses based on the production of n units.

Revenue: $20n^2 - 180$

Expenses: $4n^2 + 36n + 72$

The ratio of revenue to expenses is given by the rational expression below.

$$\frac{20n^2 - 180}{4n^2 + 36n + 72} = \frac{20(n^2-9)}{4(n^2+9n+18)} = \frac{5}{\cancel{20}\cancel{(n+3)}(n-3)} = \frac{\cancel{4}(n+6)\cancel{(n+3)}}{\cancel{4}}$$

$$= \frac{5(n-3)}{n+6}$$

$$= \frac{5n-15}{n+6}$$

A Factor the numerator and denominator of the rational expression, and simplify if possible. Show your work.

Answer: $\frac{5n-15}{n+6}$

B The rational expression $\frac{20n^2 - 180}{4n^2 + 36n + 72}$ is not defined for any values of n for which the denominator equals zero. Find the values of n for which the denominator equals zero.

$4n^2+36n+72 = 4(n+6)(n+3)$

$\frac{\cancel{4}(n+6)(n+3)}{\cancel{4}} = \frac{0}{4}$

Answer: $n = -6, -3$

C The company accountant says that the rational expression $\frac{20n^2 - 180}{4n^2 + 36n + 72}$ will never have a zero denominator because n, the number of units, is always a whole number. Explain why the accountant is correct.

$n+6 = 0$, $-6 \quad -6$, $n = -6$

$n+3 = 0$, $-3 \quad -3$, $n = -3$

The denominator is only 0 if $n = -6, -3$. If n can only be a whole number, the accountant is correct because whole #s are only + or 0