Equivalent Expressions (key)

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: e312081b

$(x+5)+(2x-3)$

Which of the following is equivalent to the given expression?

A. $3x-2$

B. $3x+2$

C. $3x-8$

D. $3x+8$

ID: e312081b Answer

Correct Answer: B

Rationale

Choice B is correct. Using the associative and commutative properties of addition, the given expression $(x+5)+(2x-3)$ can be rewritten as $(x+2x)+(5-3)$. Adding these like terms results in $3x+2$.

Choice A is incorrect and may result from adding $(x-5)+(2x+3)$. Choice C is incorrect and may result from adding $(x-5)+(2x-3)$. Choice D is incorrect and may result from adding $(x+5)+(2x+3)$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 1d3fee25

Which of the following is equivalent to $3(x+5)-6$?

A. $3x-3$

B. $3x-1$

C. $3x+9$

D. $15x-6$

ID: 1d3fee25 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the distributive property to multiply 3 and $(x+5)$ gives $3x+15-6$, which can be rewritten as $3x+9$.

Choice A is incorrect and may result from rewriting the given expression as $3(x+5-6)$. Choice B is incorrect and may result from incorrectly rewriting the expression as $(3x+5)-6$. Choice D is incorrect and may result from incorrectly rewriting the expression as $3(5x)-6$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■☐☐

ID: 60fdb4d4

Which expression is equivalent to
$(2x^2 - 4) - (-3x^2 + 2x - 7)$?

A. $5x^2 - 2x + 3$

B. $5x^2 + 2x - 3$

C. $-x^2 - 2x - 11$

D. $-x^2 + 2x - 11$

ID: 60fdb4d4 Answer

Correct Answer: A

Rationale

Choice A is correct. The given expression $(2x^2 - 4) - (-3x^2 + 2x - 7)$ can be rewritten as $2x^2 - 4 + 3x^2 - 2x + 7$. Combining like terms yields $5x^2 - 2x + 3$.

Choices B, C, and D are incorrect and may be the result of errors when applying the distributive property.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 49efde89

The expression $2x^2 + ax$ is equivalent to $x(2x+7)$ for some constant a. What is the value of a ?

A. 2

B. 3

C. 4

D. 7

ID: 49efde89 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $2x^2 + ax$ is equivalent to $x(2x+7)$ for some constant a. Distributing the x over each term in the parentheses gives $2x^2 + 7x$, which is in the same form as the first given expression, $2x^2 + ax$. The coefficient of the second term in $2x^2 + 7x$ is 7. Therefore, the value of a is 7.

Choice A is incorrect. If the value of a were 2, then $2x^2 + ax$ would be equivalent to $2x^2 + 2x$, which isn't equivalent to $x(2x+7)$. Choice B is incorrect. If the value of a were 3, then $2x^2 + ax$ would be equivalent to $2x^2 + 3x$, which isn't equivalent to $x(2x+7)$. Choice C is incorrect. If the value of a were 4, then $2x^2 + ax$ would be equivalent to $2x^2 + 4x$, which isn't equivalent to $x(2x+7)$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■☐☐

ID: 9ed9f54d

Which of the following is equivalent to
$2(x^2-x)+3(x^2-x)$?

A. $5x^2-5x$

B. $5x^2+5x$

C. $5x$

D. $5x^2$

ID: 9ed9f54d Answer

Correct Answer: A

Rationale

Choice A is correct. Since (x^2-x) is a common term in the original expression, like terms can be added: $2(x^2-x)+3(x^2-x)=5(x^2-x)$. Distributing the constant term 5 yields $5x^2-5x$.

Choice B is incorrect and may result from not distributing the negative signs in the expressions within the parentheses. Choice C is incorrect and may result from not distributing the negative signs in the expressions within the parentheses and from incorrectly eliminating the x^2-term. Choice D is incorrect and may result from incorrectly eliminating the x-term.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■☐☐

ID: 294db8ec

Which of the following is equivalent to $2x^3 + 4$?

A. $4(x^3 + 4)$

B. $4(x^3 + 2)$

C. $2(x^3 + 4)$

D. $2(x^3 + 2)$

ID: 294db8ec Answer

Correct Answer: D

Rationale

Choice D is correct. The expression $2x^3 + 4$ has two terms, $2x^3$ and 4. The greatest common factor of these two terms is 2. Factoring 2 from each of these terms yields $2(x^3) + 2(2)$, or $2(x^3 + 2)$.

Choices A and B are incorrect because 4 is not a factor of the term $2x^3$. Choice C is incorrect and may result from factoring 2 from $2x^3$ but not from 4.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■☐☐

ID: 6e06a0a7

Which of the following expressions is equivalent to $2a^2(a+3)$?

A. $5a^3$

B. $8a^5$

C. $2a^3+3$

D. $2a^3+6a^2$

ID: 6e06a0a7 Answer

Correct Answer: D

Rationale

Choice D is correct. Expanding the given expression using the distributive property yields $2a^2(a)+2a^2(3)$. Combining like terms yields $2a^2(a^1)+(2\times3)(a^2)$, or $2a^{2+1}+6a^2$, which is equivalent to $2a^3+6a^2$.

Choices A and B are incorrect and may result from incorrectly combining like terms. Choice C is incorrect and may result from distributing $2a^2$ only to a, and not to 3, in the given expression.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■☐☐

ID: df0ef054

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

Which of the following is equivalent to the expression above?

A. x^3+5x

B. $3x^3+x$

C. $2x^6-x^4-6x^2$

D. $3x^6-x^4-6x^2$

ID: df0ef054 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the distributive property to multiply the terms in the parentheses yields $(2x^3 \cdot x^3)+(2x^3 \cdot -2x)+(3x \cdot x^3)+(3x \cdot -2x)$, which is equivalent to $2x^6-4x^4+3x^4-6x^2$. Combining like terms results in $2x^6-x^4-6x^2$.

Choices A and D are incorrect and may result from conceptual errors when multiplying the terms in the given expression. Choice B is incorrect and may result from adding, instead of multiplying, $(2x^3+3x)$ and (x^3-2x).

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 127b2759

Which expression is equivalent to $8 + d^2 + 3$?

A. $d^2 + 24$

B. $d^2 + 11$

C. $d^2 + 5$

D. $d^2 - 11$

ID: 127b2759 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression can be rewritten as $d^2 + 8 + 3$. Adding 8 and 3 in this expression yields $d^2 + 11$.

Choice A is incorrect. This expression is equivalent to $d^2 + 8(3)$.

Choice C is incorrect. This expression is equivalent to $8 + d^2 - 3$.

Choice D is incorrect. This expression is equivalent to $-8 + d^2 - 3$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: fb96a5b3

Which of the following expressions is equivalent to $2(ab-3)+2$?

A. $2ab-1$

B. $2ab-4$

C. $2ab-5$

D. $2ab-8$

ID: fb96a5b3 Answer

Correct Answer: B

Rationale

Choice B is correct. Applying the distributive property to the given expression yields $2(ab)+2(-3)+2$, or $2ab-6+2$. Adding the like terms -6 and 2 results in the expression $2ab-4$.

Choice A is incorrect and may result from multiplying ab by 2 without multiplying -3 by 2 when applying the distributive property. Choices C and D are incorrect and may result from computational or conceptual errors.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: e597050f

Which expression is equivalent to $9x + 6x + 2y + 3y$?

A. $3x + 5y$

B. $6x + 8y$

C. $12x + 8y$

D. $15x + 5y$

ID: e597050f Answer

Correct Answer: D

Rationale

Choice D is correct. Combining like terms in the given expression yields $(9x + 6x) + (2y + 3y)$, or $15x + 5y$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 1e8d7183

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 1e8d7183

Which expression is equivalent to $256w^2 - 676$?

A. $(16w - 26)(16w - 26)$

B. $(8w - 13)(8w + 13)$

C. $(8w - 13)(8w - 13)$

D. $(16w - 26)(16w + 26)$

ID: 1e8d7183 Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression follows the difference of two squares pattern, $x^2 - y^2$, which factors as $(x - y)(x + y)$. Therefore, the expression $256w^2 - 676$ can be written as $(16w)^2 - 26^2$, or $(16w)(16w) - (26)(26)$, which factors as $(16w - 26)(16w + 26)$.

Choice A is incorrect. This expression is equivalent to $256w^2 - 832w + 676$.

Choice B is incorrect. This expression is equivalent to $64w^2 - 169$.

Choice C is incorrect. This expression is equivalent to $64w^2 - 208w + 169$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 0354c7de

$5x + 15$

Which of the following is equivalent to the given expression?

A. $5(x+3)$

B. $5(x+10)$

C. $5(x+15)$

D. $5(x+20)$

ID: 0354c7de Answer

Correct Answer: A

Rationale

Choice A is correct. Since 5 is a factor of both terms, $5x$ and 15, the given expression can be factored and rewritten as $5(x+3)$.

Choice B is incorrect and may result from subtracting 5 from the constant when factoring 5 from the given expression. Choice C is incorrect and may result from factoring 5 from only the first term, not both terms, of the given expression. Choice D is incorrect and may result from adding 5 to the constant when factoring 5 from the given expression.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 974d33dc

Which of the following expressions is equivalent to the sum of $(r^3 + 5r^2 + 7)$ and $(r^2 + 8r + 12)$?

A. $r^5 + 13r^3 + 19$

B. $2r^3 + 13r^2 + 19$

C. $r^3 + 5r^2 + 7r + 12$

D. $r^3 + 6r^2 + 8r + 19$

ID: 974d33dc Answer

Correct Answer: D

Rationale

Choice D is correct. Grouping like terms, the given expressions can be rewritten as $r^3 + (5r^2 + r^2) + 8r + (7 + 12)$. This can be rewritten as $r^3 + 6r^2 + 8r + 19$.

Choice A is incorrect and may result from adding the two sets of unlike terms, r^3 and r^2 as well as $5r^2$ and $8r$, and then adding the respective exponents. Choice B is incorrect and may result from adding the unlike terms r^3 and r^2 as if they were r^3 and r^3 and adding the unlike terms $5r^2$ and $8r$ as if they were $5r^2$ and $8r^2$. Choice C is incorrect and may result from errors when combining like terms.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: d4d513ff

Which expression is equivalent to $12x + 27$?

A. $12(9x + 1)$

B. $27(12x + 1)$

C. $3(4x + 9)$

D. $3(9x + 24)$

ID: d4d513ff Answer

Correct Answer: C

Rationale

Choice C is correct. Each term in the given expression, $12x + 27$, has a common factor of 3. Therefore, the expression can be rewritten as $3(4x) + 3(9)$, or $3(4x + 9)$. Thus, the expression $3(4x + 9)$ is equivalent to the given expression.

Choice A is incorrect. This expression is equivalent to $108x + 12$, not $12x + 27$.

Choice B is incorrect. This expression is equivalent to $324x + 27$, not $12x + 27$.

Choice D is incorrect. This expression is equivalent to $27x + 72$, not $12x + 27$.

Question Difficulty: Easy

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: dd4ab4c4

$$4a^2 + 20ab + 25b^2$$

Which of the following is a factor of the polynomial above?

A. $a + b$

B. $2a + 5b$

C. $4a + 5b$

D. $4a + 25b$

ID: dd4ab4c4 Answer

Correct Answer: B

Rationale

Choice B is correct. The first and last terms of the polynomial are both squares such that $4a^2 = (2a)^2$ and $25b^2 = (5b)^2$. The second term is twice the product of the square root of the first and last terms: $20ab = 2(2a)(5b)$. Therefore, the polynomial is the square of a binomial such that $4a^2 + 20ab + 25b^2 = (2a + 5b)^2$, and $(2a + 5b)$ is a factor.

Choice A is incorrect and may be the result of incorrectly factoring the polynomial. Choice C is incorrect and may be the result of dividing the second and third terms of the polynomial by their greatest common factor. Choice D is incorrect and may be the result of not factoring the coefficients.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: b8caaf84

If $p = 3x + 4$ and $v = x + 5$, which of the following is equivalent to $pv - 2p + v$?

A. $3x^2 + 12x + 7$

B. $3x^2 + 14x + 17$

C. $3x^2 + 19x + 20$

D. $3x^2 + 26x + 33$

ID: b8caaf84 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $p = 3x + 4$ and $v = x + 5$. Substituting the values for p and v into the expression $pv - 2p + v$ yields $(3x + 4)(x + 5) - 2(3x + 4) + x + 5$. Multiplying the terms $(3x + 4)(x + 5)$ yields $3x^2 + 4x + 15x + 20$. Using the distributive property to rewrite $-2(3x + 4)$ yields $-6x - 8$. Therefore, the entire expression can be represented as $3x^2 + 4x + 15x + 20 - 6x - 8 + x + 5$. Combining like terms yields $3x^2 + 14x + 17$.

Choice A is incorrect and may result from subtracting, instead of adding, the term $x + 5$. Choice C is incorrect. This is the result of multiplying the terms $(3x + 4)(x + 5)$. Choice D is incorrect and may result from distributing 2, instead of -2, to the term $3x + 4$.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: ad2ec615

Which of the following is equivalent to the expression $x^4 - x^2 - 6$?

A. $(x^2 + 1)(x^2 - 6)$

B. $(x^2 + 2)(x^2 - 3)$

C. $(x^2 + 3)(x^2 - 2)$

D. $(x^2 + 6)(x^2 - 1)$

ID: ad2ec615 Answer

Correct Answer: B

Rationale

Choice B is correct. The term x^4 can be factored as $(x^2)(x^2)$. Factoring -6 as $(2)(-3)$ yields values that add to -1, the coefficient of x^2 in the expression.

Choices A, C, and D are incorrect and may result from finding factors of -6 that don't add to the coefficient of x^2 in the original expression.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: 42c71eb5

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

Which of the following is equivalent to the expression above?

A. $4x^2+21x+33$

B. $4x^2+21x+29$

C. $4x^2+x+29$

D. $4x^2+x+33$

ID: 42c71eb5 Answer

Correct Answer: A

Rationale

Choice A is correct. The given expression can be rewritten as $(2x+5)^2+(-1)(x-2)+2(x+3)$. Applying the distributive property, the expression $(-1)(x-2)+2(x+3)$ can be rewritten as $-1(x)+(-1)(-2)+2(x)+2(3)$, or $-x+2+2x+6$. Adding like terms yields $x+8$. Substituting $x+8$ for $(-1)(x-2)+2(x+3)$ in the given expression yields $(2x+5)^2+x+8$. By the rules of exponents, the expression $(2x+5)^2$ is equivalent to $(2x+5)(2x+5)$. Applying the distributive property, this expression can be rewritten as $2x(2x)+2x(5)+5(2x)+5(5)$, or $4x^2+10x+10x+25$. Adding like terms gives $4x^2+20x+25$. Substituting $4x^2+20x+25$ for $(2x+5)^2$ in the rewritten expression yields $4x^2+20x+25+x+8$, and adding like terms yields $4x^2+21x+33$.

Choices B, C, and D are incorrect. Choices C and D may result from rewriting the expression $(2x+5)^2$ as $4x^2+25$, instead of as $4x^2+20x+25$. Choices B and C may result from rewriting the expression $-(x-2)$ as $-x-2$, instead of $-x+2$.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: a05bd3a4

Which of the following expressions is equivalent to $x^2 - 5$?

A. $(x + \sqrt{5})^2$

B. $(x - \sqrt{5})^2$

C. $(x + \sqrt{5})(x - \sqrt{5})$

D. $(x + 5)(x - 1)$

ID: a05bd3a4 Answer

Correct Answer: C

Rationale

Choice C is correct. The expression can be written as a difference of squares $x^2 - y^2$, which can be factored as $(x + y)(x - y)$. Here, $y^2 = 5$, so $y = \sqrt{5}$, and the expression therefore factors as $(x + \sqrt{5})(x - \sqrt{5})$.

Choices A and B are incorrect and may result from misunderstanding how to factor a difference of squares. Choice D is incorrect; $(x + 5)(x - 1)$ can be rewritten as $x^2 + 4x - 5$, which is not equivalent to the original expression.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: cc776a04

Which of the following is an equivalent form of
$(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$?

A. $-2.2x^2 + 1.6$

B. $-2.2x^2 + 11.2$

C. $-2.95x^2 - 7.2x + 12.16$

D. $-2.95x^2 - 7.2x + 0.64$

ID: cc776a04 Answer

Correct Answer: C

Rationale

Choice C is correct. The first expression $(1.5x - 2.4)^2$ can be rewritten as $(1.5x - 2.4)(1.5x - 2.4)$. Applying the distributive property to this product yields $(2.25x^2 - 3.6x - 3.6x + 5.76) - (5.2x^2 - 6.4)$. This difference can be rewritten as $(2.25x^2 - 3.6x - 3.6x + 5.76) + (-1)(5.2x^2 - 6.4)$. Distributing the factor of -1 through the second expression yields $2.25x^2 - 3.6x - 3.6x + 5.76 - 5.2x^2 + 6.4$. Regrouping like terms, the expression becomes $(2.25x^2 - 5.2x^2) + (-3.6x - 3.6x) + (5.76 + 6.4)$. Combining like terms yields $-2.95x^2 - 7.2x + 12.16$.

Choices A, B, and D are incorrect and likely result from errors made when applying the distributive property or combining the resulting like terms.

Question Difficulty: Medium

Question ID a520ba07

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: a520ba07

$$\sqrt[3]{x^3 y^6}$$

Which of the following expressions is equivalent to the expression above?

A. y^2

B. xy^2

C. y^3

D. xy^3

ID: a520ba07 Answer

Correct Answer: B

Rationale

Choice B is correct. One of the properties of radicals is $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$. Thus, the given expression can be rewritten as $\sqrt[3]{x^3} \cdot \sqrt[3]{y^6}$. Simplifying by taking the cube root of each part gives $x^1 \cdot y^2$, or xy^2.

Choices A, C, and D are incorrect and may be the result of incorrect application of the properties of exponents and radicals.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 5b6af6b1

Which expression is equivalent to $(d-6)(8d^2-3)$?

A. $8d^3 - 14d^2 - 3d + 18$

B. $8d^3 - 17d^2 + 48$

C. $8d^3 - 48d^2 - 3d + 18$

D. $8d^3 - 51d^2 + 48$

ID: 5b6af6b1 Answer

Correct Answer: C

Rationale

Choice C is correct. Applying the distributive property to the given expression yields $d(8d^2-3) - 6(8d^2-3)$. Applying the distributive property once again to this expression yields $(d)(8d^2) + (d)(-3) + (-6)(8d^2) + (-6)(-3)$, or $8d^3 + (-3d) + (-48d^2) + 18$. This expression can be rewritten as $8d^3 - 48d^2 - 3d + 18$. Thus, $(d-6)(8d^2-3)$ is equivalent to $8d^3 - 48d^2 - 3d + 18$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a255ae72

If $x^2 = a + b$ and $y^2 = a + c$, which of the following is equal to $(x^2 - y^2)^2$?

A. $a^2 - 2ac + c^2$

B. $b^2 - 2bc + c^2$

C. $4a^2 - 4abc + c^2$

D. $4a^2 - 2abc + b^2c^2$

ID: a255ae72 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $x^2 = a + b$ and $y^2 = a + c$. Using the distributive property, the expression $(x^2 - y^2)^2$ can be rewritten as $(x^2)^2 - 2x^2y^2 + (y^2)^2$. Substituting $a + b$ and $a + c$ for x^2 and y^2, respectively, in this expression yields $(a + b)^2 - 2((a + b)(a + c)) + (a + c)^2$. Expanding this expression yields $(a^2 + 2ab + b^2) - (2a^2 + 2bc + 2ac + 2ab) + (a^2 + 2ac + c^2)$. Combining like terms, this expression can be rewritten as $b^2 - 2bc + c^2$.

Choices A, C, and D are incorrect and may result from an error in using the distributive property, substituting, or combining like terms.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 463eec13

If $x \neq 0$, which of the following expressions is

equivalent to $\dfrac{\sqrt{16x^4y^8}}{x^3}$?

A. $8x^2y^4$

B. $4xy^4$

C. $4x^{-2}y^2$

D. $4x^{-1}y^4$

ID: 463eec13 Answer

Correct Answer: D

Rationale

Choice D is correct. Taking the square root of an exponential expression halves the exponent, so $\dfrac{\sqrt{16x^4y^8}}{x^3} = \dfrac{4x^2y^4}{x^3}$, which further reduces to $\dfrac{4y^4}{x}$. This can be rewritten as $4x^{-1}y^4$.

Choice A is incorrect and may result from neglecting the denominator of the given expression and from incorrectly calculating the square root of 16. Choice B is incorrect and may result from rewriting $\dfrac{1}{x}$ as x^1 rather than x^{-1}. Choice C is incorrect and may result from taking the square root of the variables in the numerator twice instead of once.

Question Difficulty: Medium

Question ID a1bf1c4e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: a1bf1c4e

$x^2 + 6x + 4$

Which of the following is equivalent to the expression above?

A. $(x + 3)^2 + 5$

B. $(x + 3)^2 - 5$

C. $(x - 3)^2 + 5$

D. $(x - 3)^2 - 5$

ID: a1bf1c4e Answer

Correct Answer: B

Rationale

Choice B is correct. The given quadratic expression is in standard form, and each answer choice is in vertex form. Completing the square converts the expression from standard form to vertex form. The first step is to rewrite the expression as follows: $x^2 + 6x + 4 = x^2 + 6x + 9 + 4 - 9$. The first three terms of the revised expression can be rewritten as a perfect square as follows: $x^2 + 6x + 9 + 4 - 9 = (x + 3)^2 + 4 - 9$. Combining the constant terms gives $(x + 3)^2 - 5$.

Choice A is incorrect. Squaring the binomial and simplifying the expression in choice A gives $x^2 + 6x + 9 + 5$. Combining like terms gives $x^2 + 6x + 14$, not $x^2 + 6x + 4$. Choice C is incorrect. Squaring the binomial and simplifying the expression in choice C gives $x^2 - 6x + 9 + 5$. Combining like terms gives $x^2 - 6x + 14$, not $x^2 + 6x + 4$. Choice D is incorrect. Squaring the binomial and simplifying the expression in choice D gives $x^2 - 6x + 9 - 5$. Combining like terms gives $x^2 - 6x + 4$, not $x^2 + 6x + 4$.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: f237ccfc

The sum of $-2x^2 + x + 31$ and $3x^2 + 7x - 8$ can be written in the form $ax^2 + bx + c$, where a, b, and c are constants. What is the value of $a + b + c$?

ID: f237ccfc Answer

Rationale

The correct answer is 32. The sum of the given expressions is $(-2x^2 + x + 31) + (3x^2 + 7x - 8)$. Combining like terms yields $x^2 + 8x + 23$. Based on the form of the given equation, $a = 1$, $b = 8$, and $c = 23$. Therefore, $a + b + c = 32$.

Alternate approach: Because $a + b + c$ is the value of $ax^2 + bx + c$ when $x = 1$, it is possible to first make that substitution into each polynomial before adding them. When $x = 1$, the first polynomial is equal to $-2 + 1 + 31 = 30$ and the second polynomial is equal to $3 + 7 - 8 = 2$. The sum of 30 and 2 is 32.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a391ed22

$$\left(\frac{1}{2}x + \frac{3}{2}\right)\left(\frac{3}{2}x + \frac{1}{2}\right)$$

The expression above is equivalent to $ax^2 + bx + c$, where a, b, and c are constants. What is the value of b?

ID: a391ed22 Answer

Rationale

The correct answer is $\frac{5}{2}$. The expression $\left(\frac{1}{2}x + \frac{3}{2}\right)\left(\frac{3}{2}x + \frac{1}{2}\right)$ can be written in the form $ax^2 + bx + c$, where a, b, and c are constants, by multiplying out the expression using the distributive property of multiplication over addition. The result is $\left(\frac{1}{2}x\right)\left(\frac{3}{2}x\right) + \left(\frac{1}{2}x\right)\left(\frac{1}{2}\right) + \left(\frac{3}{2}\right)\left(\frac{3}{2}x\right) + \left(\frac{3}{2}\right)\left(\frac{1}{2}\right)$. This expression can be rewritten by multiplying as indicated to give $\frac{3}{4}x^2 + \frac{1}{4}x + \frac{9}{4}x + \frac{3}{4}$, which can be simplified to $\frac{3}{4}x^2 + \frac{10}{4}x + \frac{3}{4}$, or $\frac{3}{4}x^2 + \frac{5}{2}x + \frac{3}{4}$. This is in the form $ax^2 + bx + c$, where the value of b is $\frac{5}{2}$. Note that 5/2 and 2.5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: c3a72da5

Which of the following is equivalent to the sum of $3x^4 + 2x^3$ and $4x^4 + 7x^3$?

A. $16x^{14}$

B. $7x^8 + 9x^6$

C. $12x^4 + 14x^3$

D. $7x^4 + 9x^3$

ID: c3a72da5 Answer

Correct Answer: D

Rationale

Choice D is correct. Adding the two expressions yields $3x^4 + 2x^3 + 4x^4 + 7x^3$. Because the pair of terms $3x^4$ and $4x^4$ and the pair of terms $2x^3$ and $7x^3$ each contain the same variable raised to the same power, they are like terms and can be combined as $7x^4$ and $9x^3$, respectively. The sum of the given expressions therefore simplifies to $7x^4 + 9x^3$.

Choice A is incorrect and may result from adding the coefficients and the exponents in the given expressions. Choice B is incorrect and may result from adding the exponents as well as the coefficients of the like terms in the given expressions. Choice C is incorrect and may result from multiplying, rather than adding, the coefficients of the like terms in the given expressions.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 16de54c7

$$2x^2 + 5x - 12$$

If the given expression is rewritten in the form $(2x - 3)(x + k)$, where k is a constant, what is the value of k ?

ID: 16de54c7 Answer

Rationale

The correct answer is 4. It's given that $2x^2 + 5x - 12$ can be rewritten as $(2x - 3)(x + k)$; it follows that $(2x - 3)(x + k) = 2x^2 + 5x - 12$. Expanding the left-hand side of this equation yields $2x^2 + 2kx - 3x - 3k = 2x^2 + 5x - 12$. Subtracting $2x^2$ from both sides of this equation yields $2kx - 3x - 3k = 5x - 12$. Using properties of equality, $2kx - 3x = 5x$ and $-3k = -12$. Either equation can be solved for k. Dividing both sides of $-3k = -12$ by -3 yields $k = 4$. The equation $2kx - 3x = 5x$ can be rewritten as $x(2k - 3) = 5x$. It follows that $2k - 3 = 5$. Solving this equation for k also yields $k = 4$. Therefore, the value of k is 4.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: d9137a84

Which expression represents the product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5 + y^8z^{-7}\right)$?

A. $x^{-2}z^{10} + y^{11}z^{-2}$

B. $x^{-2}z^{10} + x^{-6}z^{-2}$

C. $x^{-2}y^3z^{10} + y^8z^{-7}$

D. $x^{-2}y^3z^{10} + x^{-6}y^{11}z^{-2}$

ID: d9137a84 Answer

Correct Answer: D

Rationale

Choice D is correct. The product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5 + y^8z^{-7}\right)$ can be represented by the expression $\left(x^{-6}y^3z^5\right)\left(x^4z^5 + y^8z^{-7}\right)$. Applying the distributive property to this expression yields $\left(x^{-6}y^3z^5\right)\left(x^4z^5\right) + \left(x^{-6}y^3z^5\right)\left(y^8z^{-7}\right)$, or $x^{-6}x^4y^3z^5z^5 + x^{-6}y^3y^8z^5z^{-7}$. This expression is equivalent to $x^{-6+4}y^3z^{5+5} + x^{-6}y^{3+8}z^{5-7}$, or $x^{-2}y^3z^{10} + x^{-6}y^{11}z^{-2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 3e9cc0c2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: 3e9cc0c2

Which of the following is equivalent to
$(1-p)(1+p+p^2+p^3+p^4+p^5+p^6)$?

A. $1-p^8$

B. $1-p^7$

C. $1-p^6$

D. $1-p^5$

ID: 3e9cc0c2 Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying $(1 - p)$ by each term of the polynomial within the second pair of parentheses gives $(1 - p)1 = 1 - p$; $(1 - p)p = p - p^2$; $(1 - p)p^2 = p^2 - p^3$; $(1 - p)p^3 = p^3 - p^4$; $(1 - p)p^4 = p^4 - p^5$; $(1 - p)p^5 = p^5 - p^6$; and $(1 - p)p^6 = p^6 - p^7$. Adding these seven expressions together and combining like terms gives $1 + (p - p) + (p^2 - p^2) + (p^3 - p^3) + (p^4 - p^4) + (p^5 - p^5) + (p^6 - p^6) - p^7$, which can be simplified to $1 - p^7$.

Choices A, C, and D are incorrect and may result from incorrectly identifying the highest power of p in the expressions or incorrectly combining like terms.

Question Difficulty: Medium

Question ID 7348f046

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: 7348f046

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

Which of the following is equivalent to the given expression?

A. $x-4$

B. $3x-4$

C. $x+10$

D. $2x^2+21$

ID: 7348f046 Answer

Correct Answer: C

Rationale

Choice C is correct. Distributing the negative sign to the terms in the second parentheses yields $(2x+3)-x+7$. This expression can be rewritten as $2x-x+3+7$. Combining like terms results in $x+10$.

Choice A is incorrect and may result from not distributing the negative sign to the 7. Choice B is incorrect and may result from adding $(x-7)$ to $2x+3$ instead of subtracting $(x-7)$. Choice D is incorrect and may result from adding the product of $2x$ and x to the product of 3 and 7.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: b47419f4

$$\left(\frac{1}{2}x+3\right)-\left(\frac{2}{3}x-5\right)$$

Which of the following is equivalent to the expression above?

A. $-\frac{1}{6}x+8$

B. $-\frac{1}{6}x-2$

C. $-\frac{1}{3}x^2+\frac{1}{2}x+15$

D. $-\frac{1}{3}x^2-\frac{9}{2}x-15$

ID: b47419f4 Answer

Correct Answer: A

Rationale

Choice A is correct. By distributing the minus sign through the expression $\left(\frac{2}{3}x-5\right)$, the given expression can be rewritten as $\left(\frac{1}{2}x+3\right)-\frac{2}{3}x+5$, which is equivalent to $\frac{1}{2}x-\frac{2}{3}x+3+5$. Combining like terms gives $\left(\frac{1}{2}-\frac{2}{3}\right)x+(3+5)$, or $-\frac{1}{6}x+8$.

Choice B is incorrect and may be the result of failing to distribute the minus sign appropriately through the second term and simplifying the expression $\frac{1}{2}x+3-\frac{2}{3}x-5$. Choice C is incorrect and may be the result of multiplying the expressions $\left(\frac{1}{2}x+3\right)$ and $\left(-\frac{2}{3}x+5\right)$. Choice D is incorrect and may be the result of multiplying the expressions $\left(\frac{1}{2}x+3\right)$ and $\left(-\frac{2}{3}x-5\right)$.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: 8838a672

$$(4x^3 - 5x^2 + 3) - (6x^3 + 2x^2 - x)$$

Which of the following expressions is equivalent to the expression above?

A. $-10x^3 - 3x^2 + x + 3$

B. $-2x^3 - 7x^2 + x + 3$

C. $-2x^3 - 3x^2 + x + 3$

D. $10x^3 - 7x^2 - x + 3$

ID: 8838a672 Answer

Correct Answer: B

Rationale

Choice B is correct. Using the distributive property, the given expression can be rewritten as $4x^3 - 5x^2 + 3 - 6x^3 - 2x^2 + x$. Combining like terms, this expression can be rewritten as $(4-6)x^3 + (-5-2)x^2 + x + 3$, which is equivalent to $-2x^3 - 7x^2 + x + 3$.

Choices A, C, and D are incorrect and may result from an error when applying the distributive property or an error when combining like terms.

Question Difficulty: Medium

Question ID 0b3d25c5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 0b3d25c5

Which of the following is equivalent to $\sqrt[4]{x^2+8x+16}$, where $x > 0$?

A. $(x+4)^4$

B. $(x+4)^2$

C. $(x+4)$

D. $(x+4)^{\frac{1}{2}}$

ID: 0b3d25c5 Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression can also be written as $(x^2+8x+16)^{\frac{1}{4}}$. The trinomial $x^2+8x+16$ can be rewritten in factored form as $(x+4)^2$. Thus, the entire expression can be rewritten as $((x+4)^2)^{\frac{1}{4}}$.

Simplifying the exponents yields $(x+4)^{\frac{1}{2}}$.

Choices A, B, and C are incorrect and may result from errors made when simplifying the exponents in the expression $((x+4)^2)^{\frac{1}{4}}$.

Question Difficulty: Medium

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■☐

ID: c602140f

$$(x-11y)(2x-3y)-12y(-2x+3y)$$

Which of the following is equivalent to the expression above?

A. $x-23y$

B. $2x^2-xy-3y^2$

C. $2x^2+24xy+36y^2$

D. $2x^2-49xy+69y^2$

ID: c602140f Answer

Correct Answer: B

Rationale

Choice B is correct. Expanding all terms yields $(x - 11y)(2x - 3y) - 12y(-2x + 3y)$, which is equivalent to $2x^2 - 22xy - 3xy + 33y^2 + 24xy - 36y^2$. Combining like terms gives $2x^2 - xy - 3y^2$.

Choice A is incorrect and may be the result of using the sums of the coefficients of the existing x and y terms as the coefficients of the x and y terms in the new expressions. Choice C is incorrect and may be the result of incorrectly combining like terms. Choice D is incorrect and may be the result of using the incorrect sign in front of the 12y term.

Question Difficulty: Medium

Question ID 371cbf6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 371cbf6b

$$(ax+3)(5x^2-bx+4)=20x^3-9x^2-2x+12$$

The equation above is true for all x, where a and b are constants. What is the value of ab?

A. 18

B. 20

C. 24

D. 40

ID: 371cbf6b Answer

Correct Answer: C

Rationale

Choice C is correct. If the equation is true for all x, then the expressions on both sides of the equation will be equivalent. Multiplying the polynomials on the left-hand side of the equation gives $5ax^3-abx^2+4ax+15x^2-3bx+12$. On the right-hand side of the equation, the only x^2-term is $-9x^2$. Since the expressions on both sides of the equation are equivalent, it follows that $-abx^2+15x^2=-9x^2$, which can be rewritten as $(-ab+15)x^2=-9x^2$. Therefore, $-ab+15=-9$, which gives $ab=24$.

Choice A is incorrect. If $ab=18$, then the coefficient of x^2 on the left-hand side of the equation would be $-18+15=-3$, which doesn't equal the coefficient of x^2, -9, on the right-hand side. Choice B is incorrect. If $ab=20$, then the coefficient of x^2 on the left-hand side of the equation would be $-20+15=-5$, which doesn't equal the coefficient of x^2, -9, on the right-hand side. Choice D is incorrect. If $ab=40$, then the coefficient of x^2 on the left-hand side of the equation would be $-40+15=-25$, which doesn't equal the coefficient of x^2, -9, on the right-hand side.

Question Difficulty: Hard

3.2

Question ID 40c09d66

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 40c09d66

If $\dfrac{\sqrt{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$ for all positive values of x,

what is the value of $\dfrac{a}{b}$?

ID: 40c09d66 Answer

Rationale

The correct answer is $\dfrac{7}{6}$. The value of $\dfrac{a}{b}$ can be found by first rewriting the left-hand side of the given

equation as $\dfrac{x^{\frac{5}{2}}}{x^{\frac{4}{3}}}$. Using the properties of exponents, this expression can be rewritten as $x^{\left(\frac{5}{2}-\frac{4}{3}\right)}$. This

expression can be rewritten by subtracting the fractions in the exponent, which yields $x^{\frac{7}{6}}$. Thus, $\dfrac{a}{b}$ is $\dfrac{7}{6}$.

Note that 7/6, 1.166, and 1.167 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 34847f8a

$$\frac{2}{x-2} + \frac{3}{x+5} = \frac{rx+t}{(x-2)(x+5)}$$

The equation above is true for all $x > 2$, where r and t are positive constants. What is the value of rt ?

A. -20

B. 15

C. 20

D. 60

ID: 34847f8a Answer

Correct Answer: C

Rationale

Choice C is correct. To express the sum of the two rational expressions on the left-hand side of the equation as the single rational expression on the right-hand side of the equation, the expressions on the left-hand side must have the same denominator. Multiplying the first expression by $\frac{x+5}{x-5}$ results in $\frac{2(x+5)}{(x-2)(x+5)}$, and multiplying the second expression by $\frac{x-2}{x-2}$ results in $\frac{3(x-2)}{(x-2)(x+5)}$, so the given equation can be rewritten as $\frac{2(x+5)}{(x-2)(x+5)} + \frac{3(x-2)}{(x-2)(x+5)} = \frac{rx+t}{(x-2)(x+5)}$, or $\frac{2x+10}{(x-2)(x+5)} + \frac{3x-6}{(x-2)(x+5)} = \frac{rx+t}{(x-2)(x+5)}$. Since the two rational expressions on the left-hand side of the equation have the same denominator as the rational expression on the right-hand side of the equation, it follows that $(2x+10)+(3x-6) = rx+t$. Combining like terms on the left-hand side yields $5x+4 = rx+t$, so it follows that $r=5$ and $t=4$. Therefore, the value of rt is $(5)(4) = 20$.

Choice A is incorrect and may result from an error when determining the sign of either r or t. Choice B is incorrect and may result from not distributing the 2 and 3 to their respective terms in $\frac{2(x+5)}{(x-2)(x+5)} + \frac{3(x-2)}{(x-2)(x+5)} = \frac{rx+t}{(x-2)(x+5)}$. Choice D is incorrect and may result from a calculation error.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 137cc6fd

$$\sqrt[5]{70n}\left(\sqrt[6]{70n}\right)^2$$

For what value of x is the given expression equivalent to $(70n)^{30x}$, where $n > 1$?

ID: 137cc6fd Answer

Correct Answer: .0177, .0178, 4/225

Rationale

The correct answer is $\frac{4}{225}$. An expression of the form $\sqrt[k]{a}$, where k is an integer greater than 1 and $a \geq 0$, is equivalent to $a^{\frac{1}{k}}$. Therefore, the given expression, where $n > 1$, is equivalent to $(70n)^{\frac{1}{5}}\left((70n)^{\frac{1}{6}}\right)^2$. Applying properties of exponents, this expression can be rewritten as $(70n)^{\frac{1}{5}}(70n)^{\frac{1}{6}\cdot 2}$, or $(70n)^{\frac{1}{5}}(70n)^{\frac{1}{3}}$, which can be rewritten as $(70n)^{\frac{1}{5}+\frac{1}{3}}$, or $(70n)^{\frac{8}{15}}$. It's given that the expression $\sqrt[5]{70n}\left(\sqrt[6]{70n}\right)^2$ is equivalent to $(70n)^{30x}$, where $n > 1$. It follows that $(70n)^{\frac{8}{15}}$ is equivalent to $(70n)^{30x}$. Therefore, $\frac{8}{15} = 30x$. Dividing both sides of this equation by 30 yields $\frac{8}{450} = x$, or $\frac{4}{225} = x$. Thus, the value of x for which the given expression is equivalent to $(70n)^{30x}$, where $n > 1$, is $\frac{4}{225}$. Note that 4/225, .0177, .0178, 0.017, and 0.018 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: ea6d05bb

The expression $(3x - 23)(19x + 6)$ is equivalent to the expression $ax^2 + bx + c$, where a, b, and c are constants. What is the value of b?

ID: ea6d05bb Answer

Correct Answer: -419

Rationale

The correct answer is -419. It's given that the expression $(3x - 23)(19x + 6)$ is equivalent to the expression $ax^2 + bx + c$, where a, b, and c are constants. Applying the distributive property to the given expression, $(3x - 23)(19x + 6)$, yields $(3x)(19x) + (3x)(6) - (23)(19x) - (23)(6)$, which can be rewritten as $57x^2 + 18x - 437x - 138$. Combining like terms yields $57x^2 - 419x - 138$. Since this expression is equivalent to $ax^2 + bx + c$, it follows that the value of b is -419.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: d8789a4c

$$\frac{x^2 - c}{x - b}$$

In the expression above, *b* and *c* are positive integers. If the expression is equivalent to $x + b$ and $x \neq b$, which of the following could be the value of *c*?

A. 4

B. 6

C. 8

D. 10

ID: d8789a4c Answer

Correct Answer: A

Rationale

Choice A is correct. If the given expression is equivalent to $x + b$, then $\frac{x^2 - c}{x - b} = x + b$, where x isn't equal to b. Multiplying both sides of this equation by $x - b$ yields $x^2 - c = (x + b)(x - b)$. Since the right-hand side of this equation is in factored form for the difference of squares, the value of c must be a perfect square. Only choice A gives a perfect square for the value of c.

Choices B, C, and D are incorrect. None of these values of c produces a difference of squares. For example, when 6 is substituted for c in the given expression, the result is $\frac{x^2 - 6}{x - b}$. The expression $x^2 - 6$ can't be factored with integer values, and therefore $\frac{x^2 - 6}{x - b}$ isn't equivalent to $x + b$.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 5355c0ef

$$0.36x^2 + 0.63x + 1.17$$

The given expression can be rewritten as $a(4x^2 + 7x + 13)$, where a is a constant. What is the value of a?

ID: 5355c0ef Answer

Correct Answer: .09, 9/100

Rationale

The correct answer is $.09$. It's given that the expression $0.36x^2 + 0.63x + 1.17$ can be rewritten as $a(4x^2 + 7x + 13)$. Applying the distributive property to the expression $a(4x^2 + 7x + 13)$ yields $4ax^2 + 7ax + 13a$. Therefore, $0.36x^2 + 0.63x + 1.17$ can be rewritten as $4ax^2 + 7ax + 13a$. It follows that in the expressions $0.36x^2 + 0.63x + 1.17$ and $4ax^2 + 7ax + 13a$, the coefficients of x^2 are equivalent, the coefficients of x are equivalent, and the constant terms are equivalent. Therefore, $0.36 = 4a$, $0.63 = 7a$, and $1.17 = 13a$. Solving any of these equations for a yields the value of a. Dividing both sides of the equation $0.36 = 4a$ by 4 yields $0.09 = a$. Therefore, the value of a is 0.09. Note that .09 and 9/100 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: c81b6c57

In the expression $3(2x^2 + px + 8) - 16x(p + 4)$, p is a constant. This expression is equivalent to the expression $6x^2 - 155x + 24$. What is the value of p ?

A. -3

B. 7

C. 13

D. 155

ID: c81b6c57 Answer

Correct Answer: B

Rationale

Choice B is correct. Using the distributive property, the first given expression can be rewritten as $6x^2$ + 3px + 24 − 16px − 64x + 24, and then rewritten as $6x^2$ + (3p − 16p − 64)x + 24. Since the expression $6x^2$ + (3p − 16p − 64)x + 24 is equivalent to $6x^2$ − 155x + 24, the coefficients of the x terms from each expression are equivalent to each other; thus 3p − 16p − 64 = −155. Combining like terms gives −13p − 64 = −155. Adding 64 to both sides of the equation gives −13p = −71. Dividing both sides of the equation by −13 yields p = 7.

Choice A is incorrect. If p = −3, then the first expression would be equivalent to $6x^2$ − 25x + 24. Choice C is incorrect. If p = 13, then the first expression would be equivalent to $6x^2$ − 233x + 24. Choice D is incorrect. If p = 155, then the first expression would be equivalent to $6x^2$ − 2,079x + 24.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 2c88af4d

The expression $\dfrac{x^{-2}y^{\frac{1}{2}}}{x^{\frac{1}{3}}y^{-1}}$, where $x > 1$ and $y > 1$, is equivalent to which of the following?

A. $\dfrac{\sqrt{y}}{\sqrt[3]{x^2}}$

B. $\dfrac{y\sqrt{y}}{\sqrt[3]{x^2}}$

C. $\dfrac{y\sqrt{y}}{x\sqrt{x}}$

D. $\dfrac{y\sqrt{y}}{x^2\sqrt[3]{x}}$

ID: 2c88af4d Answer

Correct Answer: D

Rationale

Choice D is correct. For $x > 1$ and $y > 1$, $x^{\frac{1}{3}}$ and $y^{\frac{1}{2}}$ are equivalent to $\sqrt[3]{x}$ and $\sqrt{y}$, respectively. Also, x^{-2} and y^{-1} are equivalent to $\dfrac{1}{x^2}$ and $\dfrac{1}{y}$, respectively. Therefore, the given expression can be rewritten as $\dfrac{y\sqrt{y}}{x^2\sqrt[3]{x}}$.

Choices A, B, and C are incorrect because these choices are not equivalent to the given expression for $x > 1$ and $y > 1$.

For example, for $x = 2$ and $y = 2$, the value of the given expression is $2^{-\frac{5}{6}}$; the values of the choices, however, are $2^{-\frac{1}{3}}$, $2^{\frac{5}{6}}$, and 1, respectively.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 22fd3e1f

$$f(x) = x^3 - 9x$$
$$g(x) = x^2 - 2x - 3$$

Which of the following expressions is equivalent to $\dfrac{f(x)}{g(x)}$, for $x > 3$?

A. $\dfrac{1}{x+1}$

B. $\dfrac{x+3}{x+1}$

C. $\dfrac{x(x-3)}{x+1}$

D. $\dfrac{x(x+3)}{x+1}$

ID: 22fd3e1f Answer

Correct Answer: D

Rationale

Choice D is correct. Since $x^3 - 9x = x(x+3)(x-3)$ and $x^2 - 2x - 3 = (x+1)(x-3)$, the fraction $\dfrac{f(x)}{g(x)}$ can be written as $\dfrac{x(x+3)(x-3)}{(x+1)(x-3)}$. It is given that $x > 3$, so the common factor $x - 3$ is not equal to 0. Therefore, the fraction can be further simplified to $\dfrac{x(x+3)}{x+1}$.

Choice A is incorrect. The expression $\dfrac{1}{x+1}$ is not equivalent to $\dfrac{f(x)}{g(x)}$ because at $x = 0$, $\dfrac{1}{x+1}$ as a value of 1 and $\dfrac{f(x)}{g(x)}$ has a value of 0.

Choice B is incorrect and results from omitting the factor x in the factorization of $f(x)$. Choice C is incorrect and may result from incorrectly factoring $g(x)$ as $(x+1)(x+3)$ instead of $(x+1)(x-3)$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: a0b4103e

The expression $\frac{1}{3}x^2-2$ can be rewritten as $\frac{1}{3}(x-k)(x+k)$, where k is a positive constant. What is the value of k?

A. 2

B. 6

C. $\sqrt{2}$

D. $\sqrt{6}$

ID: a0b4103e Answer

Correct Answer: D

Rationale

Choice D is correct. Factoring out the coefficient $\frac{1}{3}$, the given expression can be rewritten as $\frac{1}{3}(x^2-6)$. The expression x^2-6 can be approached as a difference of squares and rewritten as $(x-\sqrt{6})(x+\sqrt{6})$. Therefore, k must be $\sqrt{6}$.

Choice A is incorrect. If k were 2, then the expression given would be rewritten as $\frac{1}{3}(x-2)(x+2)$, which is equivalent to $\frac{1}{3}x^2-\frac{4}{3}$, not $\frac{1}{3}x^2-2$.

Choice B is incorrect. This may result from incorrectly factoring the expression and finding $(x-6)(x+6)$ as the factored form of the expression. Choice C is incorrect. This may result from incorrectly distributing the $\frac{1}{3}$ and rewriting the expression as $\frac{1}{3}(x^2-2)$.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: ad038c19

Which of the following is equivalent to $\left(a+\dfrac{b}{2}\right)^2$?

A. $a^2+\dfrac{b^2}{2}$

B. $a^2+\dfrac{b^2}{4}$

C. $a^2+\dfrac{ab}{2}+\dfrac{b^2}{2}$

D. $a^2+ab+\dfrac{b^2}{4}$

ID: ad038c19 Answer

Correct Answer: D

Rationale

Choice D is correct. The expression $\left(a+\dfrac{b}{2}\right)^2$ can be rewritten as $\left(a+\dfrac{b}{2}\right)\left(a+\dfrac{b}{2}\right)$. Using the distributive property, the expression yields $\left(a+\dfrac{b}{2}\right)\left(a+\dfrac{b}{2}\right)=a^2+\dfrac{ab}{2}+\dfrac{ab}{2}+\dfrac{b^2}{4}$. Combining like terms gives $a^2+ab+\dfrac{b^2}{4}$.

Choices A, B, and C are incorrect and may result from errors using the distributive property on the given expression or combining like terms.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 12e7faf8

The equation $\dfrac{x^2+6x-7}{x+7}=ax+d$ is true for all $x \neq -7$, where a and d are integers. What is the value of $a+d$?

A. -6

B. -1

C. 0

D. 1

ID: 12e7faf8 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the expression x^2+6x-7 can be factored as $(x+7)(x-1)$, the given equation can be rewritten as $\dfrac{(x+7)(x-1)}{x+7}=ax+d$. Since $x \neq -7$, $x+7$ is also not equal to 0, so both the numerator and denominator of $\dfrac{(x+7)(x-1)}{x+7}$ can be divided by $x+7$. This gives $x-1=ax+d$. Equating the coefficient of x on each side of the equation gives $a=1$. Equating the constant terms gives $d=-1$. The sum is $1+(-1)=0$.

Choice A is incorrect and may result from incorrectly simplifying the equation. Choices B and D are incorrect. They are the values of d and a, respectively, not $a+d$.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 89fc23af

Which of the following expressions is equivalent to $\dfrac{x^2-2x-5}{x-3}$?

A. $x - 5 - \dfrac{20}{x-3}$

B. $x - 5 - \dfrac{10}{x-3}$

C. $x + 1 - \dfrac{8}{x-3}$

D. $x + 1 - \dfrac{2}{x-3}$

ID: 89fc23af Answer

Correct Answer: D

Rationale

Choice D is correct. The numerator of the given expression can be rewritten in terms of the denominator, $x-3$, as follows: $x^2-2x-5=x^2-3x+x-3-2$, which is equivalent to $x(x-3)+(x-3)-2$. So the given expression is equivalent to $\dfrac{x(x-3)+(x-3)-2}{x-3}=\dfrac{x(x-3)}{x-3}+\dfrac{x-3}{x-3}-\dfrac{2}{x-3}$. Since the given expression is defined for $x\neq 3$, the expression can be rewritten as $x+1-\dfrac{2}{x-3}$.

Long division can also be used as an alternate approach. Choices A, B, and C are incorrect and may result from errors made when dividing the two polynomials or making use of structure.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: 911c415b

$$(7532 + 100y^2) + 10(10y^2 - 110)$$

The expression above can be written in the form $ay^2 + b$, where *a* and *b* are constants. What is the value of $a + b$?

ID: 911c415b Answer

Rationale

The correct answer is 6632. Applying the distributive property to the expression yields $(7532 + 100y^2) + (100y^2 - 1100)$. Then adding together $7532 + 100y^2$ and $100y^2 - 1100$ and collecting like terms results in $200y^2 + 6432$. This is written in the form $ay^2 + b$, where $a = 200$ and $b = 6432$. Therefore $a + b = 200 + 6432 = 6632$.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: f89e1d6f

If $a = c + d$, which of the following is equivalent to the expression $x^2 - c^2 - 2cd - d^2$?

A. $(x + a)^2$

B. $(x - a)^2$

C. $(x + a)(x - a)$

D. $x^2 - ax - a^2$

ID: f89e1d6f Answer

Correct Answer: C

Rationale

Choice C is correct. Factoring -1 from the second, third, and fourth terms gives $x^2 - c^2 - 2cd - d^2 = x^2 - (c^2 + 2cd + d^2)$. The expression $c^2 + 2cd + d^2$ is the expanded form of a perfect square: $c^2 + 2cd + d^2 = (c + d)^2$. Therefore, $x^2 - (c^2 + 2cd + d^2) = x^2 - (c + d)^2$. Since $a = c + d$, $x^2 - (c + d)^2 = x^2 - a^2$. Finally, because $x^2 - a^2$ is the difference of squares, it can be expanded as $x^2 - a^2 = (x + a)(x - a)$.

Choices A and B are incorrect and may be the result of making an error in factoring the difference of squares $x^2 - a^2$. Choice D is incorrect and may be the result of incorrectly combining terms.

Question Difficulty: Hard

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: e117d3b8

If *a* and *c* are positive numbers, which of the following is equivalent to $\sqrt{(a+c)^3} \cdot \sqrt{a+c}$?

A. $a+c$

B. a^2+c^2

C. $a^2+2ac+c^2$

D. a^2c^2

ID: e117d3b8 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the property that $\sqrt{x}\sqrt{y} = \sqrt{xy}$ for positive numbers x and y, with x = $(a+c)^3$ and y = a + c, it follows that $\sqrt{(a+c)^3} \cdot \sqrt{a+c} = \sqrt{(a+c)^4}$. By rewriting $(a+c)^4$ as $((a+c)^2)^2$, it is possible to simplify the square root expression as follows: $\sqrt{((a+c)^2)^2} = (a+c)^2 = a^2+2ac+c^2$.

Choice A is incorrect and may be the result of $\sqrt{(a+c)^3} \div \sqrt{(a+c)}$. Choice B is incorrect and may be the result of incorrectly rewriting $(a+c)^2$ as $a^2 + c^2$. Choice D is incorrect and may be the result of incorrectly applying properties of exponents.

Question Difficulty: Hard