

# Question ID 7f4b32e1

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

ID: 7f4b32e1

$$g(x) = \frac{3}{5}x + \frac{7}{6}$$
$$h(x) = 6x - 5$$

The functions  $g$  and  $h$  are defined by the equations shown. Which expression is equivalent to  $g(x) \cdot h(x)$ ?

- A.  $\frac{18x^2}{5} - \frac{35}{6}$
- B.  $\frac{18x^2}{5} + \frac{27x}{11} - \frac{35}{6}$
- C.  $\frac{18x^2}{5} - 4x - \frac{35}{6}$
- D.  $\frac{18x^2}{5} + 4x - \frac{35}{6}$

ID: 7f4b32e1 Answer

Correct Answer: D

## Rationale

Choice D is correct. It's given that  $g(x) = \frac{3}{5}x + \frac{7}{6}$  and  $h(x) = 6x - 5$ . Substituting  $\frac{3}{5}x + \frac{7}{6}$  for  $g(x)$  and  $6x - 5$  for  $h(x)$  in the expression  $g(x) \cdot h(x)$  yields  $(\frac{3}{5}x + \frac{7}{6})(6x - 5)$ . This expression can be rewritten as  $\frac{3}{5}x(6x - 5) + \frac{7}{6}(6x - 5)$ , or  $\frac{18x^2}{5} - 3x + 7x - \frac{35}{6}$ , which is equivalent to  $\frac{18x^2}{5} + 4x - \frac{35}{6}$ .

Choice A is incorrect. This expression is equivalent to  $\frac{3}{5}x(6x) + \frac{7}{6}(-5)$ , not  $(\frac{3}{5}x + \frac{7}{6})(6x - 5)$ .

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

Choice C is incorrect. This expression is equivalent to  $(\frac{3}{5}x - \frac{7}{6})(6x + 5)$ , not  $(\frac{3}{5}x + \frac{7}{6})(6x - 5)$ .

Question Difficulty: Medium

## Question ID bc68d9f9

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

ID: bc68d9f9

Which expression is equivalent to  $6x^8y^2 + 12x^2y^2$ ?

- A.  $6x^2y^2(2x^6)$
- B.  $6x^2y^2(x^4)$
- C.  $6x^2y^2(x^6 + 2)$
- D.  $6x^2y^2(x^4 + 2)$

ID: bc68d9f9 Answer

Correct Answer: C

Rationale

Choice C is correct. Since each term of the given expression has a common factor of  $6x^2y^2$ , it may be rewritten as  $6x^2y^2(x^6) + 6x^2y^2(2)$ , or  $6x^2y^2(x^6 + 2)$ .

Choice A is incorrect. This expression is equivalent to  $12x^8y^2$ , not  $6x^8y^2 + 12x^2y^2$ .

Choice B is incorrect. This expression is equivalent to  $6x^6y^2$ , not  $6x^8y^2 + 12x^2y^2$ .

Choice D is incorrect. This expression is equivalent to  $6x^6y^2 + 12x^2y^2$ , not  $6x^8y^2 + 12x^2y^2$ .

Question Difficulty: Medium

# Question ID eb385faa

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

ID: eb385faa

Which expression is equivalent to  $(7x^3 + 7x) - (6x^3 - 3x)$ ?

- A.  $x^3 + 10x$
- B.  $-13x^3 + 10x$
- C.  $-13x^3 + 4x$
- D.  $x^3 + 4x$

ID: eb385faa Answer

Correct Answer: A

Rationale

Choice A is correct. Applying the distributive property, the given expression can be written as  $7x^3 + 7x - 6x^3 + 3x$ . Grouping like terms in this expression yields  $(7x^3 - 6x^3) + (7x + 3x)$ . Combining like terms in this expression yields  $x^3 + 10x$ .

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

Choice C 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

## Question ID 219a57aa

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

ID: 219a57aa

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

- 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: 219a57aa Answer

Correct Answer: D

Rationale

Choice D is correct. The product of  $(x^{-6}y^3z^5)$  and  $(x^4z^5 + y^8z^{-7})$  can be represented by the expression  $(x^{-6}y^3z^5)(x^4z^5 + y^8z^{-7})$ . Applying the distributive property to this expression yields  $(x^{-6}y^3z^5)(x^4z^5) + (x^{-6}y^3z^5)(y^8z^{-7})$ , 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 5e61ba73

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

ID: 5e61ba73

The expression  $90y^5 - 54y^4$  is equivalent to  $ry^4(15y - 9)$ , where  $r$  is a constant. What is the value of  $r$ ?

ID: 5e61ba73 Answer

Correct Answer: 6

Rationale

The correct answer is **6**. Applying the distributive property to the expression  $ry^4(15y - 9)$  yields  $15ry^5 - 9ry^4$ . Since  $90y^5 - 54y^4$  is equivalent to  $ry^4(15y - 9)$ , it follows that  $90y^5 - 54y^4$  is also equivalent to  $15ry^5 - 9ry^4$ . Since these expressions are equivalent, it follows that corresponding coefficients are equivalent. Therefore,  $90 = 15r$  and  $-54 = -9r$ . Solving either of these equations for  $r$  will yield the value of  $r$ . Dividing both sides of  $90 = 15r$  by 15 yields  $6 = r$ . Therefore, the value of  $r$  is **6**.

Question Difficulty: Medium

# Question ID 01264050

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

ID: 01264050

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: 01264050 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

## Question ID 581be4a1

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

ID: 581be4a1

Which of the following expressions is equivalent to  $8x^{10} - 8x^9 + 88x$ ?

- A.  $x(7x^{10} - 7x^9 + 87x)$
- B.  $x(8^{10} - 8^9 + 88)$
- C.  $8x(x^{10} - x^9 + 11x)$
- D.  $8x(x^9 - x^8 + 11)$

ID: 581be4a1 Answer

Correct Answer: D

Rationale

Choice D is correct. Since  $8x$  is a common factor of each term in the given expression, the expression can be rewritten as  $8x(x^9 - x^8 + 11)$ .

Choice A is incorrect. This expression is equivalent to  $7x^{11} - 7x^{10} + 87x^2$ .

Choice B is incorrect. This expression is equivalent to  $8^{10}x - 8^9x + 88x$ .

Choice C is incorrect. This expression is equivalent to  $8x^{11} - 8x^{10} + 88x^2$ .

Question Difficulty: Medium

# Question ID 3a7aa34d

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

ID: 3a7aa34d

Which expression is equivalent to  $a^{\frac{11}{12}}$ , where  $a > 0$ ?

- A.  $\sqrt[12]{a^{132}}$
- B.  $\sqrt[144]{a^{132}}$
- C.  $\sqrt[121]{a^{132}}$
- D.  $\sqrt[11]{a^{132}}$

ID: 3a7aa34d Answer

Correct Answer: B

Rationale

Choice B is correct. Since  $\frac{12}{12} = 1$ , multiplying the exponent of the given expression by  $\frac{12}{12}$  yields an equivalent expression:  $a^{\left(\frac{11}{12}\right)\left(\frac{12}{12}\right)} = a^{\left(\frac{132}{144}\right)}$ . Since  $\frac{132}{144} = 132\left(\frac{1}{144}\right)$ , the expression  $a^{\frac{132}{144}}$  can be rewritten as  $a^{\left(132\right)\left(\frac{1}{144}\right)}$ . Applying properties of exponents, this expression can be rewritten as  $\left(a^{132}\right)^{\frac{1}{144}}$ . An expression of the form  $(m)^{\frac{1}{k}}$ , where  $m > 0$  and  $k > 0$ , is equivalent to  $\sqrt[k]{m}$ . Therefore,  $\left(a^{132}\right)^{\frac{1}{144}}$  is equivalent to  $\sqrt[144]{a^{132}}$ .

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

Choice C 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

# Question ID a351b98d

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

ID: a351b98d

The expression  $\frac{24}{6x+42}$  is equivalent to  $\frac{4}{x+b}$ , where  $b$  is a constant and  $x > 0$ . What is the value of  $b$ ?

- A. 7
- B. 10
- C. 24
- D. 252

ID: a351b98d Answer

Correct Answer: A

Rationale

Choice A is correct. Since the given expressions are equivalent and the numerator of the second expression is  $\frac{1}{6}$  of the numerator of the first expression, the denominator of the second expression must also be  $\frac{1}{6}$  of the denominator of the first expression. By the distributive property,  $\frac{1}{6}(6x + 42)$  is equivalent to  $\frac{1}{6}(6x) + \frac{1}{6}(42)$ , or  $x + 7$ . Therefore, the value of  $b$  is 7.

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

Choice C 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

# Question ID 5883daba

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

ID: 5883daba

Which expression is equivalent to  $(8x^3 + 8) - (x^3 - 2)$ ?

- A.  $8x^3 + 6$
- B.  $7x^3 + 10$
- C.  $8x^3 + 10$
- D.  $7x^3 + 6$

ID: 5883daba Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression is equivalent to  $8x^3 + 8 - x^3 - (-2)$ , or  $8x^3 + 8 - x^3 + 2$ . Combining like terms in this expression yields  $7x^3 + 10$ .

Choice A is incorrect. This expression is equivalent to  $(8x^3 + 8) - 2$ , not  $(8x^3 + 8) - (x^3 - 2)$ .

Choice C is incorrect. This expression is equivalent to  $(8x^3 + 8) - (-2)$ , not  $(8x^3 + 8) - (x^3 - 2)$ .

Choice D is incorrect. This expression is equivalent to  $(8x^3 + 8) - (x^3 + 2)$ , not  $(8x^3 + 8) - (x^3 - 2)$ .

Question Difficulty: Medium

## Question ID 27b93ec4

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

ID: 27b93ec4

Which expression is equivalent to  $(x^2 + 11)^2 + (x - 5)(x + 5)$ ?

- A.  $x^4 + 23x^2 - 14$
- B.  $x^4 + 23x^2 + 96$
- C.  $x^4 + 12x^2 + 121$
- D.  $x^4 + x^2 + 146$

ID: 27b93ec4 Answer

Correct Answer: B

Rationale

Choice B is correct. The expression  $(x^2 + 11)^2$  can be written as  $(x^2 + 11)(x^2 + 11)$ , which is equivalent to  $x^2(x^2 + 11) + 11(x^2 + 11)$ . Distributing  $x^2$  and 11 to  $(x^2 + 11)$  yields  $x^4 + 11x^2 + 11x^2 + 121$ , or  $x^4 + 22x^2 + 121$ . The expression  $(x - 5)(x + 5)$  is equivalent to  $(x - 5)x + (x - 5)5$ . Distributing  $x$  and 5 to  $(x - 5)$  yields  $x^2 - 5x + 5x - 25$ , or  $x^2 - 25$ . Therefore, the expression  $(x^2 + 11)^2 + (x - 5)(x + 5)$  is equivalent to  $(x^4 + 22x^2 + 121) + (x^2 - 25)$ , or  $x^4 + 22x^2 + 121 + x^2 - 25$ . Combining like terms in this expression yields  $x^4 + 23x^2 + 96$ .

Choice A is incorrect. Equivalent expressions must be equivalent for any value of  $x$ . Substituting 0 for  $x$  in this expression yields  $-14$ , whereas substituting 0 for  $x$  in the given expression yields  $96$ .

Choice C is incorrect. Equivalent expressions must be equivalent for any value of  $x$ . Substituting 0 for  $x$  in this expression yields  $121$ , whereas substituting 0 for  $x$  in the given expression yields  $96$ .

Choice D is incorrect. Equivalent expressions must be equivalent for any value of  $x$ . Substituting 0 for  $x$  in this expression yields  $146$ , whereas substituting 0 for  $x$  in the given expression yields  $96$ .

Question Difficulty: Medium

# Question ID ce53810c

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

ID: ce53810c

Which expression is equivalent to  $\frac{h^{15}q^7}{h^5q^{21}}$ , where  $h > 0$  and  $q > 0$ ?

- A.  $\frac{h^{10}}{q^{14}}$
- B.  $\frac{h^3}{q^3}$
- C.  $h^{10}q^{14}$
- D.  $h^3q^3$

ID: ce53810c Answer

Correct Answer: A

Rationale

Choice A is correct. For positive values of  $a$ ,  $\frac{a^m}{a^n} = a^{(m-n)}$ , where  $m$  and  $n$  are integers. Since it's given that  $h > 0$  and  $q > 0$ , this property can be applied to rewrite the given expression as  $(h^{(15-5)})(q^{(7-21)})$ , which is equivalent to  $h^{10}q^{-14}$ . For positive values of  $a$ ,  $a^{-n} = \frac{1}{a^n}$ . This property can be applied to rewrite the expression  $h^{10}q^{-14}$  as  $(h^{10})\left(\frac{1}{q^{14}}\right)$ , which is equivalent to  $\frac{h^{10}}{q^{14}}$ .

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

Choice C 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

# Question ID f8a698f7

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

ID: f8a698f7

$$(5x^3 - 3) - (-4x^3 + 8)$$

The given expression is equivalent to  $bx^3 - 11$ , where  $b$  is a constant. What is the value of  $b$ ?

ID: f8a698f7 Answer

Correct Answer: 9

Rationale

The correct answer is 9. The given expression can be rewritten as  $(5x^3 - 3) + (-1)(-4x^3 + 8)$ . By applying the distributive property, this expression can be rewritten as  $5x^3 - 3 + 4x^3 + (-8)$ , which is equivalent to  $(5x^3 + 4x^3) + (-3 + (-8))$ . Adding like terms in this expression yields  $9x^3 - 11$ . Since it's given that  $(5x^3 - 3) - (-4x^3 + 8)$  is equivalent to  $bx^3 - 11$ , it follows that  $9x^3 - 11$  is equivalent to  $bx^3 - 11$ . Therefore, the coefficients of  $x^3$  in these two expressions must be equivalent, and the value of  $b$  must be 9.

Question Difficulty: Medium

# Question ID 91f6f890

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

ID: 91f6f890

Which expression is equivalent to  $\sqrt[7]{x^9y^9}$ , where  $x$  and  $y$  are positive?

- A.  $\sqrt[7]{x^9}y^9$
- B.  $(\sqrt[7]{xy})^9$
- C.  $(xy)^{\frac{9}{7}}$
- D.  $(xy)^9\sqrt[7]{x^9}$

ID: 91f6f890 Answer

Correct Answer: B

Rationale

Choice B is correct. For positive values of  $a$  and  $b$ ,  $a^m b^m = (ab)^m$ ,  $\sqrt[n]{a} = (a)^{\frac{1}{n}}$ , and  $(a^j)^k = a^{jk}$ . Therefore, the given expression,  $\sqrt[7]{x^9y^9}$ , can be rewritten as  $\sqrt[7]{(xy)^9}$ . This expression is equivalent to  $((xy)^9)^{\frac{1}{7}}$ , which can be rewritten as  $(xy)^{\frac{9}{7}}$ , or  $(xy)^9\sqrt[7]{x^9}$ .

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

Choice C 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

# Question ID aef182c

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

ID: aef182c

$$f(x) = x^2 + bx$$
$$g(x) = 9x^2 - 27x$$

Functions  $f$  and  $g$  are given, and in function  $f$ ,  $b$  is a constant. If  $f(x) \cdot g(x) = 9x^4 - 26x^3 - 3x^2$ , what is the value of  $b$ ?

- A.  $-26$
- B.  $-\frac{26}{9}$
- C.  $\frac{1}{9}$
- D.  $9$

ID: aef182c Answer

Correct Answer: C

Rationale

Choice C is correct. Multiplying the given functions  $f$  and  $g$  yields  $f(x) \cdot g(x) = (x^2 + bx)(9x^2 - 27x)$ . Applying the distributive property to the right-hand side of this equation yields  $f(x) \cdot g(x) = (x^2)(9x^2 - 27x) + (bx)(9x^2 - 27x)$ . Applying the distributive property once again to the right-hand side of this equation yields

$f(x) \cdot g(x) = (x^2)(9x^2) - (x^2)(27x) + (bx)(9x^2) - (bx)(27x)$ , which is equivalent to

$f(x) \cdot g(x) = 9x^4 - 27x^3 + 9bx^3 - 27bx^2$ . Factoring out  $x^3$  from the second and third terms yields

$f(x) \cdot g(x) = 9x^4 + (-27 + 9b)x^3 - 27bx^2$ . Since the left-hand sides of

$f(x) \cdot g(x) = 9x^4 + (-27 + 9b)x^3 - 27bx^2$  and  $f(x) \cdot g(x) = 9x^4 - 26x^3 - 3x^2$  are equal, it follows that

$(-27 + 9b)x^3 = -26x^3$ , or  $-27 + 9b = -26$ , and  $-27bx^2 = -3x^2$ , or  $-27b = -3$ . Adding 27 to each side of

$-27 + 9b = -26$  yields  $9b = 1$ . Dividing each side of this equation by 9 yields  $b = \frac{1}{9}$ . Similarly, dividing each side of

$-27b = -3$  by  $-27$  yields  $b = \frac{1}{9}$ . Therefore, the value of  $b$  is  $\frac{1}{9}$ .

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

# Question ID a65952d9

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

ID: a65952d9

Which expression is equivalent to  $\frac{8x(x-7)-3(x-7)}{2x-14}$ , where  $x > 7$ ?

- A.  $\frac{x-7}{5}$
- B.  $\frac{8x-3}{2}$
- C.  $\frac{8x^2-3x-14}{2x-14}$
- D.  $\frac{8x^2-3x-77}{2x-14}$

ID: a65952d9 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression has a common factor of 2 in the denominator, so the expression can be rewritten as  $\frac{8x(x-7)-3(x-7)}{2(x-7)}$ . The three terms in this expression have a common factor of  $(x - 7)$ . Since it's given that  $x > 7$ ,  $x$  can't be equal to 7, which means  $(x - 7)$  can't be equal to 0. Therefore, each term in the expression,  $\frac{8x(x-7)-3(x-7)}{2(x-7)}$ , can be divided by  $(x - 7)$ , which gives  $\frac{8x-3}{2}$ .

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

Choice C 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