# Question ID 8bb5aaf8

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 8bb5aaf8**

If $3x - 27 = 24$, what is the value of $x - 9$?

A. $1$

B. $8$

C. $24$

D. $35$

**ID: 8bb5aaf8 Answer**

Correct Answer: B

Rationale

Choice B is correct. Dividing each side of the given equation by $3$ yields $x$ - $9 = 8$. Therefore, the value of $x$ - $9$ is $8$.

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

Choice C is incorrect. This is the value of $3x$ - $27$, not $x$ - $9$.

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

Question Difficulty: Medium

# Question ID 1cc17260

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 1cc17260**

$$2x + 16 = a(x + 8)$$

In the given equation, $a$ is a constant. If the equation has infinitely many solutions, what is the value of $a$?

**ID: 1cc17260 Answer**

Correct Answer: 2

Rationale

The correct answer is $2$. An equation with one variable, $x$, has infinitely many solutions only when both sides of the equation are equal for any defined value of $x$. It's given that $2x + 16 = ax + 8$, where $a$ is a constant. This equation can be rewritten as $2x + 8 = ax + 8$. If this equation has infinitely many solutions, then both sides of this equation are equal for any defined value of $x$. Both sides of this equation are equal for any defined value of $x$ when $2 = a$. Therefore, if the equation has infinitely many solutions, the value of $a$ is $2$.

Alternate approach: If the given equation, $2x + 16 = ax + 8$, has infinitely many solutions, then both sides of this equation are equal for any value of $x$. If $x = 0$, then substituting $0$ for $x$ in $2x + 16 = ax + 8$ yields $20 + 16 = a0 + 8$, or $16 = 8a$. Dividing both sides of this equation by $8$ yields $2 = a$.

Question Difficulty: Medium

# Question ID 3b188791

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 3b188791**

$$3x + 21 = 3x + k$$

In the given equation, $k$ is a constant. The equation has infinitely many solutions. What is the value of $k$?

**ID: 3b188791 Answer**

Correct Answer: 21

Rationale

The correct answer is $21$. It's given that the equation $3x + 21 = 3x + k$ has infinitely many solutions. If an equation in one variable has infinitely many solutions, then the equation is true for any value of the variable. Subtracting $3x$ from both sides of the given equation yields $k = 21$. Since this equation must be true for any value of $x$, the value of $k$ is $21$.

Question Difficulty: Medium

# Question ID d31c0757

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: d31c0757**

If $\frac{x}{8} = 5$, what is the value of $\frac{8}{x}$?

**ID: d31c0757 Answer**

Correct Answer: .2, 1/5

Rationale

The correct answer is $\frac{1}{5}$. Since the number $5$ can also be written as $\frac{5}{1}$, the given equation can also be written as $\frac{x}{8} = \frac{5}{1}$. This equation is equivalent to $\frac{8}{x} = \frac{1}{5}$. Therefore, the value of $\frac{8}{x}$ is $\frac{1}{5}$. Note that 1/5 and .2 are examples of ways to enter a correct answer.

Alternate approach: Multiplying both sides of the equation $\frac{x}{8} = 5$ by $8$ yields $x = 40$. Substituting $40$ for $x$ into the expression $\frac{8}{x}$ yields $\frac{8}{40}$, or $\frac{1}{5}$.

Question Difficulty: Medium

# Question ID a4b53a50

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: a4b53a50**

$$66x = 66x$$

How many solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

**ID: a4b53a50 Answer**

Correct Answer: C

Rationale

Choice C is correct. If the two sides of a linear equation are equivalent, then the equation is true for any value. If an equation is true for any value, it has infinitely many solutions. Since the two sides of the given linear equation $66x = 66x$ are equivalent, the given equation has infinitely many solutions.

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 11436130

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 11436130**

The perimeter of an isosceles triangle is $36$ feet. Each of the two congruent sides of the triangle has a length of $10$ feet. What is the length, in feet, of the third side?

A. $10$

B. $12$

C. $16$

D. $18$

**ID: 11436130 Answer**

Correct Answer: C

Rationale

Choice C is correct. It's given that the perimeter of an isosceles triangle is $36$ feet and that each of the two congruent sides has a length of $10$ feet. The perimeter of a triangle is the sum of the lengths of its three sides. The equation $10 + 10 + x = 36$ can be used to represent this situation, where $x$ is the length, in feet, of the third side. Combining like terms on the left-hand side of this equation yields $20 + x = 36$. Subtracting $20$ from each side of this equation yields $x = 16$. Therefore, the length, in feet, of the third side is $16$.

Choice A is incorrect. This would be the length, in feet, of the third side if the perimeter was $30$ feet, not $36$ feet.

Choice B is incorrect. This would be the length, in feet, of the third side if the perimeter was $32$ feet, not $36$ feet.

Choice D is incorrect. This would be the length, in feet, of the third side if the perimeter was $38$ feet, not $36$ feet.

Question Difficulty: Medium

# Question ID c71c5c71

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: c71c5c71**

Nasir bought $9$ storage bins that were each the same price. He used a coupon for $\$63$ off the entire purchase. The cost for the entire purchase after using the coupon was $\$27$. What was the original price, in dollars, for $1$ storage bin?

**ID: c71c5c71 Answer**

Correct Answer: 10

Rationale

The correct answer is $10$. It's given that the cost for the entire purchase was $\$\ 27$ after a coupon was used for $\$\ 63$ off the entire purchase. Adding the amount of the coupon to the purchase price yields $27 + 63 = 90$. Thus, the cost for the entire purchase before using the coupon was $\$\ 90$. It's given that Nasir bought $9$ storage bins. The original price for $1$ storage bin can be found by dividing the total cost by $9$. Therefore, the original price, in dollars, for $1$ storage bin is $\frac{90}{9}$, or $10$.

Question Difficulty: Medium

# Question ID 49785a71

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 49785a71**

$$4x + 12 = \frac{a(x+3)}{2}$$

In the given equation, $a$ is a constant. If the equation has infinitely many solutions, what is the value of $a$?

A. $0$

B. $3$

C. $8$

D. $12$

**ID: 49785a71 Answer**

Correct Answer: C

Rationale

Choice C is correct. If an equation has infinitely many solutions, then the two sides of the equation must be equivalent. Multiplying each side of the given equation by $2$ yields $8x + 24 = ax + 3$. Since $8$ is a common factor of both terms on the left-hand side of this equation, the equation can be rewritten as $8x + 3 = ax + 3$. The two sides of this equation are equivalent when $a = 8$. Therefore, if the given equation has infinitely many solutions, the value of $a$ is $8$.

Alternate approach: If the given equation, $4x + 12 = \frac{ax+3}{2}$, has infinitely many solutions, then both sides of this equation are equal for any value of $x$. If $x = 0$, then substituting $0$ for $x$ in the given equation yields $40 + 12 = \frac{a0+3}{2}$, or $12 = \frac{3}{2}a$. Dividing both sides of this equation by $\frac{3}{2}$ yields $8 = a$.

Choice A is incorrect. If the value of $a$ is $0$, the given equation is equivalent to $4x + 12 = 0$, which has one solution, not infinitely many solutions.

Choice B is incorrect. If the value of $a$ is $3$, the given equation is equivalent to $4x + 12 = \frac{3x+3}{2}$, or $4x + 12 = \frac{3}{2}x + \frac{9}{2}$, which has one solution, not infinitely many solutions.

Choice D is incorrect. If the value of $a$ is $12$, the given equation is equivalent to $4x + 12 = \frac{12x+3}{2}$, or $4x + 12 = 6x + 18$, which has one solution, not infinitely many solutions.

Question Difficulty: Medium

# Question ID 02e51c3d

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 02e51c3d**

A manager is responsible for ordering supplies for a shaved ice shop. The shop's inventory starts with $4{,}500$ paper cups, and the manager estimates that $70$ of these paper cups are used each day. Based on this estimate, in how many days will the supply of paper cups reach $1{,}700$?

A. $20$

B. $40$

C. $60$

D. $80$

**ID: 02e51c3d Answer**

Correct Answer: B

Rationale

Choice B is correct. It's given that the shop's inventory starts with $4{,}500$ paper cups and that the manager estimates that $70$ of these paper cups are used each day. Let $x$ represent the number of days in which the estimated supply of paper cups will reach $1{,}700$. The equation $4{,}500 - 70x = 1{,}700$ represents this situation. Subtracting $4{,}500$ from both sides of this equation yields $-70x = -2{,}800$. Dividing both sides of this equation by $-70$ yields $x = 40$. Therefore, based on this estimate, the supply of paper cups will reach $1{,}700$ in $40$ days.

Choice A is incorrect. After $20$ days, the estimated supply of paper cups would be $4{,}500 - 70(20)$, or $3{,}100$ cups, not $1{,}700$ cups.

Choice C is incorrect. After $60$ days, the estimated supply of paper cups would be $4{,}500 - 70(60)$, or $300$ cups, not $1{,}700$ cups.

Choice D is incorrect. After $80$ days, the estimated supply of paper cups would be $4{,}500 - 70(80)$, or $-1{,}100$ cups, which isn't possible.

Question Difficulty: Medium

# Question ID 3c94b861

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 3c94b861**

A candle is made of $17$ ounces of wax. When the candle is burning, the amount of wax in the candle decreases by $1$ ounce every $4$ hours. If $6$ ounces of wax remain in this candle, for how many hours has it been burning?

A. $3$

B. $6$

C. $24$

D. $44$

**ID: 3c94b861 Answer**

Correct Answer: D

Rationale

Choice D is correct. It's given that the candle starts with $17$ ounces of wax and has $6$ ounces of wax remaining after a period of time has passed. The amount of wax the candle has lost during the time period can be found by subtracting the remaining amount of wax from the amount of wax the candle was made of, which yields $17 - 6$ ounces, or $11$ ounces. This means the candle loses $11$ ounces of wax during that period of time. It's given that the amount of wax decreases by $1$ ounce every $4$ hours. If $h$ represents the number of hours the candle has been burning, it follows that $\frac{1}{4} = \frac{11}{h}$. Multiplying both sides of this equation by $4h$ yields $h = 44$. Therefore, the candle has been burning for $44$ hours.

Choice A is incorrect and may result from using the equation $\frac{1}{4} = \frac{h}{11}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation, and then rounding to the nearest whole number.

Choice B is incorrect. This is the amount of wax, in ounces, remaining in the candle, not the number of hours it has been burning.

Choice C is incorrect and may result from using the equation $\frac{1}{4} = \frac{6}{h}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation.

Question Difficulty: Medium

# Question ID da845af8

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: da845af8**

$$7(2x - 3) = 63$$

Which equation has the same solution as the given equation?

A. $2x - 3 = 9$

B. $2x - 3 = 56$

C. $2x - 21 = 63$

D. $2x - 21 = 70$

**ID: da845af8 Answer**

Correct Answer: A

Rationale

Choice A is correct. Dividing each side of the given equation by 7 yields $\frac{72x - 3}{7} = \frac{63}{7}$, or $2x - 3 = 9$. Therefore, the equation $2x - 3 = 9$ is equivalent to the given equation and has the same solution.

Choice B is incorrect. This equation is equivalent to $72x - 3 = 392$, not $72x - 3 = 63$.

Choice C is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 63$.

Choice D is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 70$.

Question Difficulty: Medium

# Question ID 159b76a4

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 159b76a4**

A line segment that has a length of $115$ centimeters $(\text{cm})$ is divided into three parts. One part is $47$ cm long. The other two parts have lengths that are equal to each other. What is the length, in $\text{cm}$, of one of the other two parts of equal length?

**ID: 159b76a4 Answer**

Correct Answer: 34

Rationale

The correct answer is $34$. It's given that a line segment has a length of $115 \text{ cm}$ and is divided into three parts, where one part is $47 \text{ cm}$ long and the other two parts have lengths that are equal. If $x$ represents the length, in cm, of each of the two parts of equal length, then the equation $47 + x + x = 115$, or $47 + 2x = 115$, represents this situation. Subtracting $47$ from each side of this equation yields $2x = 68$. Dividing each side of this equation by $2$ yields $x = 34$. Therefore, the length, in cm, of one of the two parts of equal length is $34$.

Question Difficulty: Medium

# Question ID b9890078

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: b9890078**

A rocket contained $467{,}000$ kilograms (kg) of propellant before launch. Exactly $21$ seconds after launch, $362{,}105$ kg of this propellant remained. On average, approximately how much propellant, in kg, did the rocket burn each second after launch?

A. $4{,}995$

B. $17{,}243$

C. $39{,}481$

D. $104{,}895$

**ID: b9890078 Answer**

Correct Answer: A

Rationale

Choice A is correct. It's given that the rocket contained $467{,}000$ kilograms (kg) of propellant before launch and had $362{,}105$ kg remaining exactly $21$ seconds after launch. Finding the difference between the amount, in kg, of propellant before launch and the remaining amount, in kg, of propellant after launch gives the amount, in kg, of propellant burned during the $21$ seconds: $467{,}000 - 362{,}105 = 104{,}895$. Dividing the amount of propellant burned by the number of seconds yields $\frac{104{,}895}{21} = 4{,}995$. Thus, an average of $4{,}995$ kg of propellant burned each second after launch.

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 finding the amount of propellant burned, rather than the amount of propellant burned each second.

Question Difficulty: Medium

# Question ID 8e92a0bc

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| PSAT/NMSQT & PSAT 10 | Math | Algebra | Linear equations in one variable | |

**ID: 8e92a0bc**

$$\frac{1}{4}(x+5)-\frac{1}{3}(x+5)=-7$$

What value of $x$ is the solution to the given equation?

A. $-12$

B. $-5$

C. $79$

D. $204$

**ID: 8e92a0bc Answer**

Correct Answer: C

Rationale

Choice C is correct. For the given equation, $x+5$ is a factor of both terms on the left-hand side. Therefore, the given equation can be rewritten as $\frac{1}{4}-\frac{1}{3}x+5=-7$, or $\frac{3}{12}-\frac{4}{12}x+5=-7$, which is equivalent to $-\frac{1}{12}x+5=-7$. Multiplying both sides of this equation by -12 yields $x+5=84$. Subtracting $5$ from both sides of this equation yields $x=79$.

Choice A is incorrect. This is the value of $x$ for which the left-hand side of the given equation equals $\frac{7}{12}$, not -7.

Choice B is incorrect. This is the value of $x$ for which the left-hand side of the given equation equals $0$, not -7.

Choice D is incorrect. This is the value of $x$ for which the left-hand side of the given equation equals $-\frac{209}{12}$, not -7.

Question Difficulty: Medium