New York State Testing Program

Mathematics

Common Core Sample Questions

Grade 7

Domain: Expressions and Equations
Item: MC

1 When $\frac{5}{8}x+1\frac{1}{3}$ is subtracted from $1\frac{1}{4}x-5\frac{1}{6}$, the result is

A $\frac{5}{8}x-3\frac{5}{6}$

B $\frac{5}{8}x-6\frac{1}{2}$

C $-\frac{5}{8}x+3\frac{5}{6}$

D $-\frac{5}{8}x+6\frac{1}{2}$

Key: B

Aligned CCLS: 7.EE.1

Commentary: This question aligns to CCLS 7.EE.1 because it assesses a student's ability to apply properties to subtract linear expressions with rational coefficients.

Rationale: Option B indicates the correct conversion between mixed numbers and improper fractions, the creation of like denominators to add fractions with unlike denominators, and the correct performance of operations, specifically subtraction.

$1\frac{1}{4}x-5\frac{1}{6}=\frac{5}{4}x-\frac{31}{6}$ and $\frac{5}{8}x+1\frac{1}{3}=\frac{5}{8}x+\frac{4}{3}$

$$\frac{5}{4}x-\frac{31}{6}-\left(\frac{5}{8}x+\frac{4}{3}\right)=\frac{10}{8}x-\frac{31}{6}-\frac{5}{8}x-\frac{8}{6}$$

$$=\frac{5}{8}x-\frac{39}{6}$$

$$=\frac{5}{8}x-6\frac{1}{2}$$

Selecting Option A indicates the addition of $\frac{4}{3}$ rather than the subtraction of $\frac{4}{3}$ from $-\frac{31}{6}$, which is a result of the operation of subtraction not being applied to both of the terms in the expression $\frac{5}{8}x+1\frac{1}{3}$. Selection of Option C indicates an incorrect order of subtraction between the two expressions $[(\frac{5}{8}\mathrm{x}+1\frac{1}{3})$ - $(1\frac{1}{4}x-5\frac{1}{6})]$ as well as an error in subtraction. Selecting Option D indicates an incorrect order of subtraction between the two expressions $[(\frac{5}{8}x+1\frac{1}{3})$ - $(1\frac{1}{4}x-5\frac{1}{6})]$, but an accurate execution of subtraction.

Domain: Expressions and Equations
Item: MC

2 Which expression below is equivalent to $\frac{4}{3}x + 4\frac{2}{3}$?

A $\frac{4}{3}(x + 2)$

B $\frac{1}{3}(4x + 6)$

C $\frac{2}{3}(2x + 4)$

D $\frac{2}{3}(2x + 7)$

Key: D

Aligned CCLS: 7.EE.1

Commentary: This question aligns to CCLS 7.EE.1 because it assesses a student's ability to apply properties of operations to factor linear expressions with rational coefficients. Again, the intent of 7.EE.1 is being aware of the property used to factor a linear expression with rational coefficients, not just on the ability to factor a linear expression.

Rationale: The mathematical expression in Option D is the only choice that represents a correct factorization of the linear expression, $\frac{4}{3}x + 4\frac{2}{3} = \frac{4}{3}x + \frac{14}{3} = \frac{2}{3}(2x + 7)$. Selecting Option A is the result of pulling out what appears to be a superficial similarity between the two terms of the expression given the presence of a 4 and 3 in both terms. Selecting Option B may indicate the selection of the unit fraction as the common factor and a misunderstanding of factoring $\frac{1}{3}$ from the mixed number $4\frac{2}{3}$. Option C indicates that factoring out a common term is accomplished by subtraction rather than division [$\frac{2}{3}$ subtracted from both terms yields $\frac{2}{3}(2x + 4)$].

Domain: Expressions and Equations
Item: MC

3 At a discount furniture store, Chris offered a salesperson $600 for a couch and a chair. The offer includes the 8% sales tax. If the salesperson accepts the offer, what would be the price of the furniture, to the *nearest dollar*, before tax?

A $552
B $556
C $592
D $648

Key: B

Aligned CCLS: 7.RP.3, 7.EE.3

Commentary: This question aligns to CCLS 7.RP.3 because it assesses the use of proportional relationships to solve multi-step percent problems involving tax. This also item aligns to 7.EE.3 because it assesses the student's ability to solve a multi-step, real-life problem with positive rational numbers and assesses the student's ability to recognize a reasonable answer.

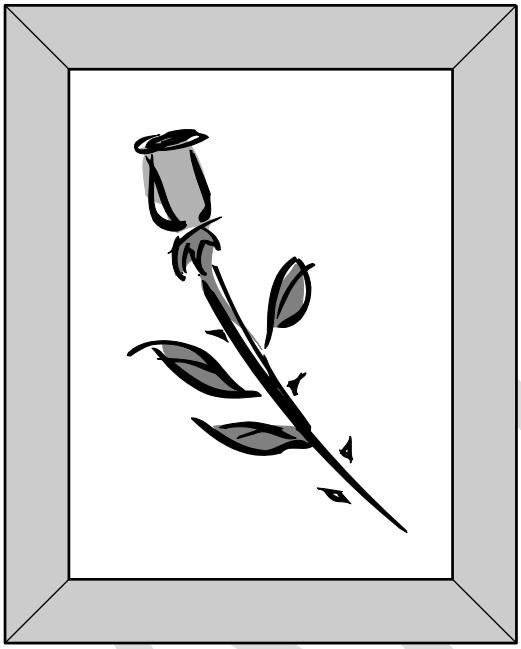
Rationale: Option B is correct. The student may use proportions or linear equations to solve this problem. To solve this algebraically, the student would need to show that the original offer for the couch and chair, x, has been increased by 8%. The equation below shows a possible setup for showing the unknown original value of the couch and chair, x, with the 8% (written as a decimal) tax on the original value of the couch, which yields the purchase price of $600. The student must change the percent to a decimal and then divide $600 by 1.08. The answer then needs to be rounded to the nearest dollar.

$$x + .08x = 600$$
$$1.08x = 600$$
$$x = 555.56$$

Selecting Option A indicates a misunderstanding of when the tax is applied in the problem. The tax is applied to an unknown value of the couch and is included in the offer. In option A the 8% is incorrectly subtracted from the $600 that already includes the tax [600-(.08 x 600) = 552]. Selecting Option C indicates the subtraction of $8 rather than the application of 8% from the $600 purchase price. Selecting Option D indicates the incorrect application of the 8% sales tax to the $600 (1.08 x 600 = 648).

Domain: Expressions and Equations
Item: CR

4 A framed picture 24 inches wide and 28 inches high is shown in the diagram below.



The picture will be hung on a wall where the distance from the floor to ceiling is 8 feet. The center of the picture must be $5\frac{1}{4}$ feet from the floor. Determine the distance from the ceiling to the top of the picture frame.

Show your work.

Key: $1\frac{7}{12}$ feet, 1 foot 7 inches, or 19 inches and appropriate work is shown.

Aligned CCLS: 7.EE.3

Commentary: This question aligns to CCLS 7.EE.3 because it assesses a student's ability to convert measurement units between forms that are appropriate, apply properties of operations, and determine if their answer is reasonable.

Rationale:

$1\frac{7}{12}$ or an equivalent answer is correct. The student may choose to convert all measures to inches, all measures to feet, or use a combination of both inches and feet. The center of the picture is $5\frac{1}{4}$ feet from the floor, which is $8 - 5\frac{1}{4} = 2\frac{3}{4}$ feet from the ceiling. The student must then subtract the $\frac{1}{2} \times 2\frac{1}{3} = 1\frac{1}{6}$ feet from the center of the picture to the top of the picture: $2\frac{3}{4} - 1\frac{1}{6} = 1\frac{7}{12}$ feet.

Domain: Expressions and Equations
Item: CR

5 Mandy's monthly earnings consist of a fixed salary of $2800 and an 18% commission on all her monthly sales. To cover her planned expenses, Mandy needs to earn an income of at least $6400 this month.

Part A: Write an inequality that, when solved, will give the amount of sales Mandy needs to cover her planned expenses.

Answer: _____

Part B: Graph the solution of the inequality on the number line.

Key:

Part A: Mandy must sell at least $20,000 in goods this month in order to cover her planned expenses.

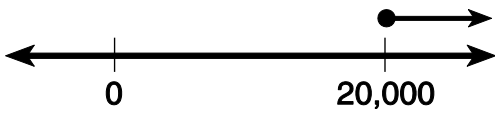
Part B:

Aligned CCLS: 7.EE.4b

Commentary: This question aligns to CCLS 7.EE.4b because it assesses a student's ability to write and solve a linear inequality based on a word problem, represent the solution graphically, and interpret it in the context of the problem.

Rationale: Let x represent the amount of sales Mandy needs to make this month. It follows that

$$2800 + 0.18x \geq 6400$$
$$0.18x \geq 3600$$
$$x \geq 20{,}000$$



Domain: Ratios and Proportional Relationships
Item: MC

6 Appliances at Discount City Store are on sale for 70% of the original price. Eli has a coupon for an 18% discount on the sale price. If the original price of a microwave oven is $500, how much will Eli pay for the oven before tax?

A $440
B $287
C $260
D $240

Key: B

Aligned CCLS: 7.RP.3

Commentary: This question aligns to CCLS 7.RP.3 because it assesses a student's ability to compute successive percents.

Rationale: Option B is correct. This involves the application of 70% to the original price of $500 followed by the application of the 18% coupon on the sale price.

.70(500) = 350
350(.82) = 287

or

.70(500) = 350
350(.18) = 63

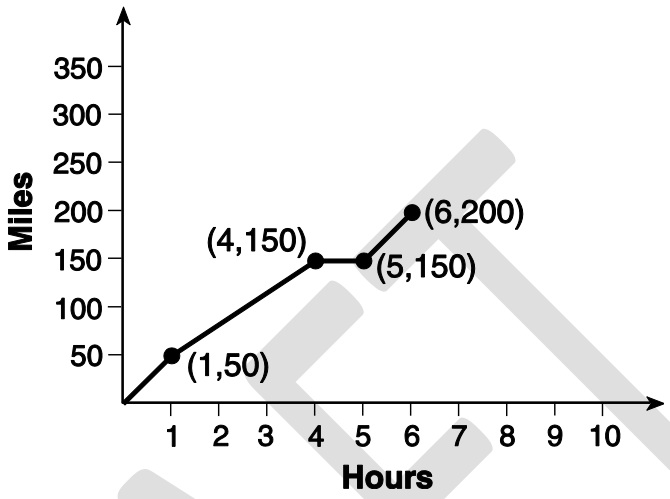
$$\begin{array}{r} 350 \\ -\ 63 \\ \hline 287 \end{array}$$

or 500 x 0.7 x 0.82 = 287

Selecting Option A indicates the addition of the two percents, 70% and 18%, and their sum applied to the $500 (.88 x 500 = 440). Selecting Option C indicates an application of the 18% coupon to the original price and the subtraction of that from the 70% off discount price [(500 .7) – (500 x .18) = 260]. Selecting Option D indicates an application of each reduction in price independently and then the addition of these two separate reductions [(.3 x 500) + (.18 x 500) = 240].

Domain: Ratios and Proportional Relationships
Item: MC

7 Last summer, a family took a trip to a beach that was about 200 miles away from their home. The graph below shows the distance driven, in miles, and the time, in hours, taken for the trip.



What was their average speed from hour 1 to hour 4?

A 25 miles per hour

B $33\frac{1}{3}$ miles per hour

C $66\frac{2}{3}$ miles per hour

D 100 miles per hour

Key: B

Aligned CCLS: 7.RP.2b

Commentary: This question is aligned to CCLS 7.RP.2b because it assesses a student's ability to identify the constant of proportionality from a graph.

Rationale: Option B is correct. The student calculates that the family travels 100 miles during this 3-hour period. Their speed is $\frac{100\ miles}{3\ hours} = 33\frac{1}{3}$ miles per hour. Selecting Option A indicates the division of the distance traveled, 100 miles, from hour 1 to hour 4 by four rather than three ($\frac{100}{4} = 25$). Selecting Option C suggests the division of the distance of the whole trip by the 3-hour time interval ($\frac{200}{3} = 66\frac{2}{3}$). Selecting Option D

indicates the division of the distance traveled, 100 miles, by one hour or the failure to divide the distance by time at all.

Domain: The Number System
Item: MC

8 The numerical expression $\frac{5}{6}-\frac{2}{3}\left(6-\frac{1}{2}\right)+\frac{3}{4}$ is equal to

A $-\frac{25}{12}$

B $-\frac{17}{12}$

C $\frac{20}{12}$

D $\frac{43}{12}$

Key: A

Aligned CCLS: 7.NS.1d and 7.NS.2c

Commentary: This question aligns with CCLS 7.NS.1d and 7.NS.2c because it assesses a student's ability to apply properties of operations to add, subtract, and multiply rational numbers.

Rationale: Option A is correct. The fraction is the result of a correct use of the order of operations and execution of those operations with rational numbers.

$\frac{5}{6} - \frac{2}{3}\left(6 - \frac{1}{2}\right) + \frac{3}{4}$

$\frac{5}{6} - \frac{2}{3}\left(\frac{11}{2}\right) + \frac{3}{4}$

$\frac{5}{6} - \frac{11}{3} + \frac{3}{4}$

$-\frac{17}{6} + \frac{3}{4}$

$-\frac{25}{12}$

or

$\left(\frac{5}{6}\right) - \left(\frac{12}{3}\right) + \left(\frac{2}{6}\right) + \left(\frac{3}{4}\right)$

$\left(\frac{10}{12}\right) - \left(\frac{48}{12}\right) + \left(\frac{4}{12}\right) + \left(\frac{9}{12}\right)$

$\frac{10 - 48 + 4 + 9}{12}$

$\frac{-25}{12}$

Selecting Option D indicates a sign error that results in the addition rather than the subtraction of two values (incorrectly adds $\frac{17}{6}+\frac{3}{4}$ rather than subtracts $-\frac{17}{6}+\frac{3}{4}$). Options B and C represent miscalculations or other process errors.

Domain: Expressions and Equations
Item: CR

9 When John bought his new computer, he purchased an online computer help service. The help service has a yearly fee of $25.50 and a $10.50 charge for each help session a person uses. If John can only spend $170 for the computer help this year, what is the maximum number of help sessions he can use this year?

Key: 13 sessions

Aligned CCLS: 7.EE.4b

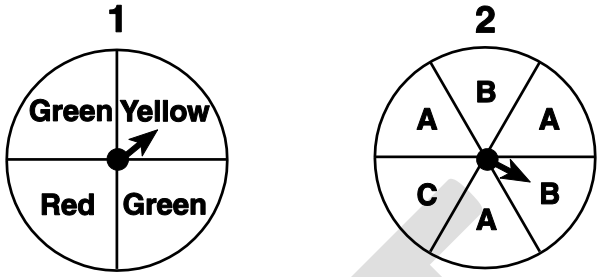
Commentary: This question is aligned to CCLS 7.EE.4b because it assesses a student's ability to write and solve a linear inequality based on a word problem with a real-world application.

Rationale: If x represents the number of online help service sessions per year, then

$10.5x + 25.50 \leq 170$
$10.5x \leq 144.50$
$x \leq 13.76$
13 sessions

Domain: Statistics and Probability
Item: CR

10 During an experiment, the two spinners below will be spun.



Represent the sample space for this experiment. How many of these outcomes consist of a green and an A?

Key: 6
The sample space is

(Green, A)	(Yellow, A)	(Green, A)	(Red, A)
(Green, B)	(Yellow, B)	(Green, B)	(Red, B)
(Green, A)	(Yellow, A)	(Green, A)	(Red, A)
(Green, B)	(Yellow, B)	(Green, B)	(Red, B)
(Green, A)	(Yellow, A)	(Green, A)	(Red, A)
(Green, C)	(Yellow, C)	(Green, C)	(Red, C)

Aligned CCLS: 7.SP.8b

Commentary: This question is aligned to CCLS 7.SP.8b because it assesses a student's ability to represent a sample space and to count the outcomes that meet certain criteria.

Rationale: After the sample space is represented, the student can list or otherwise identify the six outcomes that satisfy the conditions listed.

Domain: Geometry
Item: MC

11 A scale drawing for a construction project uses a scale of 1 inch = 4 feet. The dimensions of the rectangular family room on the scale drawing are 7.5 inches by 12 inches.

What will be the actual area of the floor of the family room after the construction project is completed?

A 90 square feet
B 156 square feet
C 360 square feet
D 1440 square feet

Key: D

Aligned CCLS: 7.G.1

Commentary: This question is aligned to CCLS 7.G.1 because it assesses a student's ability to use scale drawings and compute the area of a figure.

Rationale: Option D is correct. If the dimensions of the family room on the scale drawing are 7.5 inches by 12 inches, the dimensions of the actual room will be 30 feet by 48 feet. Therefore, the actual area of the family room will be 30 x 48 = 1440 square feet. Selecting Option A indicates the multiplication of the dimensions from the scale drawing (7.5 x 12 = 90). Selecting Option B indicates the perimeter, not the area, of the actual room (30 + 30 + 48 + 48 = 156). Selecting Option C is the result of multiplying the dimensions from the scale drawing (7.5 x 12 = 90) and attempting to scale the product by multiplying by 4 (90 x 4 = 360).

Domain: Statistics and Probability
Item: CR

12 During an experiment, three coins were tossed once.

Part A: Give the sample space to show all possible outcomes for tossing three coins one time, using the letter H when a coin faces "heads" up, and the letter T when it faces "tails" up.

Part B: Based on your answer to part A, how many outcomes consist of 3 heads or 3 tails?

Part C: During a math class, each of 24 students tossed three coins once. Based on your answer to part B, how many students would you expect to get a result of 3 heads or 3 tails?

Show your work.

Key:

Part A:

H	H	H	T	T	T
H	H	T	T	T	H
H	T	H	T	H	T
T	H	H	H	T	T

Part B: 2

Part C: 6

Aligned CCLS: 7.SP.8b

Commentary: This question aligns with CCLS 7.SP.8b because it assesses a student's ability to create a sample space of possible outcomes and to draw conclusions (inferences) from it (7.SP.1).

Rationale: Part A:

H	H	H	T	T	T
H	H	T	T	T	H
H	T	H	T	H	T
T	H	H	H	T	T

This is the full sample space because it shows all possible outcomes of having 3 heads, 3 tails, 2 heads and 1 tail, 2 tails and 1 head.

Part B: 2 is correct because there is one way out of 8 that gives 3 heads and one way out of 8 that gives 3 tails.

Part C: 6 is correct because you would expect 2/8 of the 24 trials to yield 3 heads or 3 tails.

Domain: Ratios and Proportional Relationships
Item: CR

13 While on vacation, a group can rent bicycles and scooters by the week. They get a reduced rental rate if they rent 5 bicycles for every 2 scooters rented. The reduced rate per bicycle is $15.50 per week and the reduced rate per scooter is $160 per week. The sales tax on each rental is 12%.

The group has $1600 available to spend on bicycle and scooter rentals. What is the greatest number of bicycles and the greatest number of scooters the group can rent if the ratio of bicycles to scooters is 5:2?

Show Your Work.

Key: 15 bicycles and 6 scooters

Aligned CCLS: 7.RP.3

Commentary: This question is aligned with CCLS 7.RP.3 because students have to use ratios to determine the number of bicycles and scooters.

Rationale: The student may find the cost of 5 bikes plus tax = $86.80 and the cost of 2 scooters plus tax = $358.40 for a total of $445.20, $\frac{1600}{445.20}$ = 3.59, so 3 groups of 5 bikes and 2 scooters = 15 bikes and 6 scooters.

or

The student may make a table of values

Number of Bikes	5	10	15	20
Number of Scooters	2	4	6	8
Value of Bikes	77.50	155	232.50	310
Value of Scooters	320	640	960	1280
Value of Bikes and Scooters	397.50	795	1192.50	1590
Cost with Tax	445.20	890.40	1335.60	1780

Domain: Ratios and Proportional Relationships
Item: CR

14 David is making his own strawberry yogurt. In David's mixture, the number of strawberries is proportional to the amount of milk, in cups. David uses 4 cups of milk for every 14 strawberries in his mixture.

Which equation represents the relationship between *s*, the number of strawberries, and *m*, the number of cups of milk he uses?

A $s = \frac{1}{10}m$

B $s = \frac{7}{2}m$

C $s = \frac{2}{5}m$

D $s = \frac{9}{2}m$

Key: B

Aligned CCLS: 7.RP.2c

Commentary: This question is aligned with CCLS 7.RP.2c because the student represents proportional relationships by equations.

Rationale: Option B is correct. The proportional relationship 4:14 is equivalent to 2:7 and is the constant of proportionality that relates the number of strawberries needed per cups of milk. Options A, C, and D all use the wrong proportion.

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