

## ACHIEVE THE CORE

Sample Problems<sup>1</sup>

Some questions you might want to consider:

- What is something that you observed from one of the problems you've tried?
- How can assessing (through tests, HW problems, exit tickets) all 3 aspects of rigor affect student learning?
- What does it look like when we ask students to work on procedural skill and fluency, conceptual understanding or application?
- What standards do these problems align to?

## Fluency

1. Mark each equation true or false.

$$8 \times 9 = 80 - 8 \quad \underline{\hspace{2cm}}$$

$$54 \div 9 = 24 \div 6 \quad \underline{\hspace{2cm}}$$

$$7 \times 5 = 25 \quad \underline{\hspace{2cm}}$$

$$8 \times 3 = 4 \times 6 \quad \underline{\hspace{2cm}}$$

$$49 \div 7 = 56 \div 8 \quad \underline{\hspace{2cm}}$$

2. Compute each of the following:

$$357 + 17,999 + 1$$

$$357 + 17,999$$

$$899 + 1343 + 101$$

$$37 \cdot 25 \cdot 4$$

$$1001 \cdot 20$$

<sup>1</sup> Selections here are from the PARCC item development ITN. Information at: <http://www.parcconline.org/parcc-releases-itn-develop-new-assessments>. Documents available at: [http://myflorida.com/apps/vbs/vbs\\_ad.view\\_ad?advertisement\\_key\\_num=98159](http://myflorida.com/apps/vbs/vbs_ad.view_ad?advertisement_key_num=98159). Excerpts here are from Revised Appendix F. Illustrations of innovative characteristics in the ITN and/or in its appendices are not intended as literal previews of future PARCC assessment tasks.

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3. If  $A = 356 \times 618$  and  $B = 2.4/0.1$ , what is  $A \div B$  divided by 18?

## Conceptual Understanding

4. Find two numbers in this table that differ by approximately two thousand.

893,462
840,924
824,595
824,162
810,920
808,879
799,982
778,877
777,852
766,398

5. Amber didn't know what  $7 \times 5$  equals, but she knew  $5 \times 5 = 25$  and  $2 \times 5 = 10$ . Use drawings, words and/or equations to explain why Amber can add 25 and 10 to find what  $7 \times 5$  equals.

6. Write four fractions that are all equal to 5.

\_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

7. Which number is least and which is greatest?

$$\frac{3}{4}$$

2

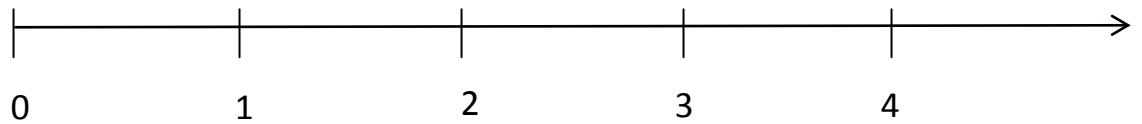
$$\frac{4}{4}$$

$$\frac{3}{5}$$

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8. Write a number that is greater than  $\frac{1}{5}$  and less than  $\frac{1}{4}$ . \_\_\_\_\_

9. Plot each of the following on the number line:  $2$     $\frac{5}{4}$     $3 \times \frac{1}{2}$     $\frac{3}{4} + \frac{3}{4}$     $2 - \frac{1}{10}$



10. What is the value of  $3x + y + 3 - 3(x + y)$  when  $x = 18.22$  and  $y = -1$ ?

11. Write a number in each space to make true equations.

1 tenth = \_\_\_\_\_ hundredths

100 tenths = \_\_\_\_\_ hundredths

0.1 tenths = \_\_\_\_\_ hundredths

0.01 tenths = \_\_\_\_\_ hundredths

$\frac{1}{10}$  tenths = \_\_\_\_\_ hundredths

\_\_\_\_\_ tenths = 0.1 hundredths

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12. Mark each statement true or false.

$108 \times 30$  is equal to a four-digit number. \_\_\_\_\_

$6731 \times 23$  is equal to a four-digit number. \_\_\_\_\_

$2244 \div 11$  is equal to a three-digit number. \_\_\_\_\_

13. "Give me 8 sheep and then we will have an equal number," said one shepherd to another. "No, you give 8 sheep and then I will have twice as many as you," replied the other shepherd. How many sheep did each shepherd have to start with?

Show your work.

14. What are two different equations with the same solution as  $3(y - 1) = 8$ ?

15. Consider the triangle ABC with coordinates A (0, 3), B (-1, 0) and C (2, 1). The center of the circumscribed circle is:

$(\quad, \quad)$

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16. A student performs the following steps in solving an equation.

$$\frac{x+3}{2x+6} = 1$$

$$x+3 = 2x+6$$

$$x = -3$$

Is the solution correct? If yes, explain why. If no, explain what was wrong with the student's reasoning.

17. **Prove or disprove:** The point  $(1, \sqrt{3})$  lies on the circle that has its center at the origin and passes through the point  $(0, 2)$ .

### Application

18. On Monday, Joe walked  $\frac{1}{2}$  mile. On Tuesday, Joe walked  $\frac{1}{2}$  mile again. On Wednesday, Joe walked some more. Altogether Joe walked  $2\frac{1}{2}$  miles. How far did Joe walk on Wednesday?

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## 19. A Plate of Cookies:

There were 28 cookies on a plate.  
Five children each ate one cookie.  
Two children each ate 3 cookies.  
One child ate 5 cookies.  
The rest of the children each ate two cookies.  
Then the plate was empty.  
How many children ate two cookies? Show your work.

20. 9 large trucks are carrying  $\frac{1}{2}$  ton of lumber each. 7 small trucks are carrying  $\frac{1}{4}$  ton of lumber each. How many total tons are being carried by all of the trucks?

21. Suppose Tom wrote check #556 on November 5, 1995, and check #953 on September 26, 1997. What is a good guess for when Tom wrote check #678? Explain how you arrived at your guess.

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22. Sale Prices:

Max bought 2 items that were on sale.

One item was 10% off.

One item was 20% off.

Max says he saved 15% altogether.

- a) Could Max be right?
- b) Could Max be wrong?

23. A bird flew 20 miles in 100 minutes at constant speed. At that speed:

- a. How long would it take the bird to fly 6 miles?
- b. How far would the bird fly in 15 minutes?
- c. How fast is the bird flying in miles per hour?
- d. What is the bird's pace in minutes per mile?

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24. School officials have decided to build a new football field that will be 120 yards by 53 yards. However, the owner of a local nursery has donated enough grass seed to plant 81,000 square feet of grass. Since they have more than enough grass seed for the football field, school officials would like to plant a uniformly wide border around the field. What are the dimensions of the 81,000 square feet rectangular area that should be planted for the football field and uniformly wide border?

25. If a company spills chemicals in the local waterway, the company must pay a fine. The fine is given by a formula that is written in state law:

$$D = 0.508GS(A + B + C)$$

In this formula,

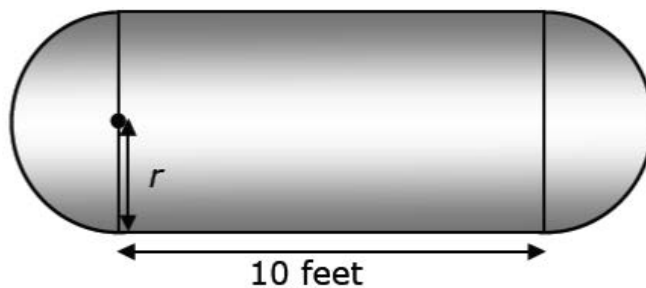
- D is the amount of the fine in dollars.
  - G is the number of gallons of material spilled.
  - S is an environmental factor in the range from 1 to 5 that takes into account wildlife characteristics in the spill area.
  - A, B and C are chemical factors that take into account how damaging the spilled material is. Each chemical factor ranges from 1 (least damaging) to 5 (most damaging).
- a) A company spilled kerosene in an area of environmental factor  $S= 2$ . Kerosene has chemical factors  $A= 1.4$ ,  $B= 2.4$ , and  $C=1.3$ . The company paid a \$10 million fine.
- How many gallons of kerosene were spilled?
  - How many dollars did the company pay for each gallon of kerosene spilled?



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- b) Rearrange the formula in the state law to write a formula that gives the number of dollars charged per gallon of spill.
- c) What is the maximum possible fine in dollars per gallon of spill?

26. Propane tanks are used to store propane gas. Often these tanks are made in the shape of a cylinder with the hemispheres at the ends.



The Propane Tank Company makes tanks with this shape, in different sizes. The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres,  $r$ , will be different depending on the size of the tank.

A standard tank measures 6 feet in diameter. The company wants to double the capacity of its standard tank. What should the radius of the new tank be?

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27.

Year	Fertilizer ( $\times 10^5$ tons)	Yield ( $\times 10$ kg/ha)
1956	0.06	52.3
1966	0.38	45.8
1970	1.32	19.1
1974	1.95	88.9
1975	2.32	82.9
1976	2.03	93.9
1977	2.08	79.2
1978	2.9	97.9
1979	3.72	101.7
1980	3.59	102.9
1981	3.54	91.9
1982	3.87	102.2
1983	3.83	85.8
1984	4.87	102.1
1985	5.9	95.4
1986	5.55	81.19
1987	5.66	97.03
1988	5.58	83.57
1989	5.75	93.5

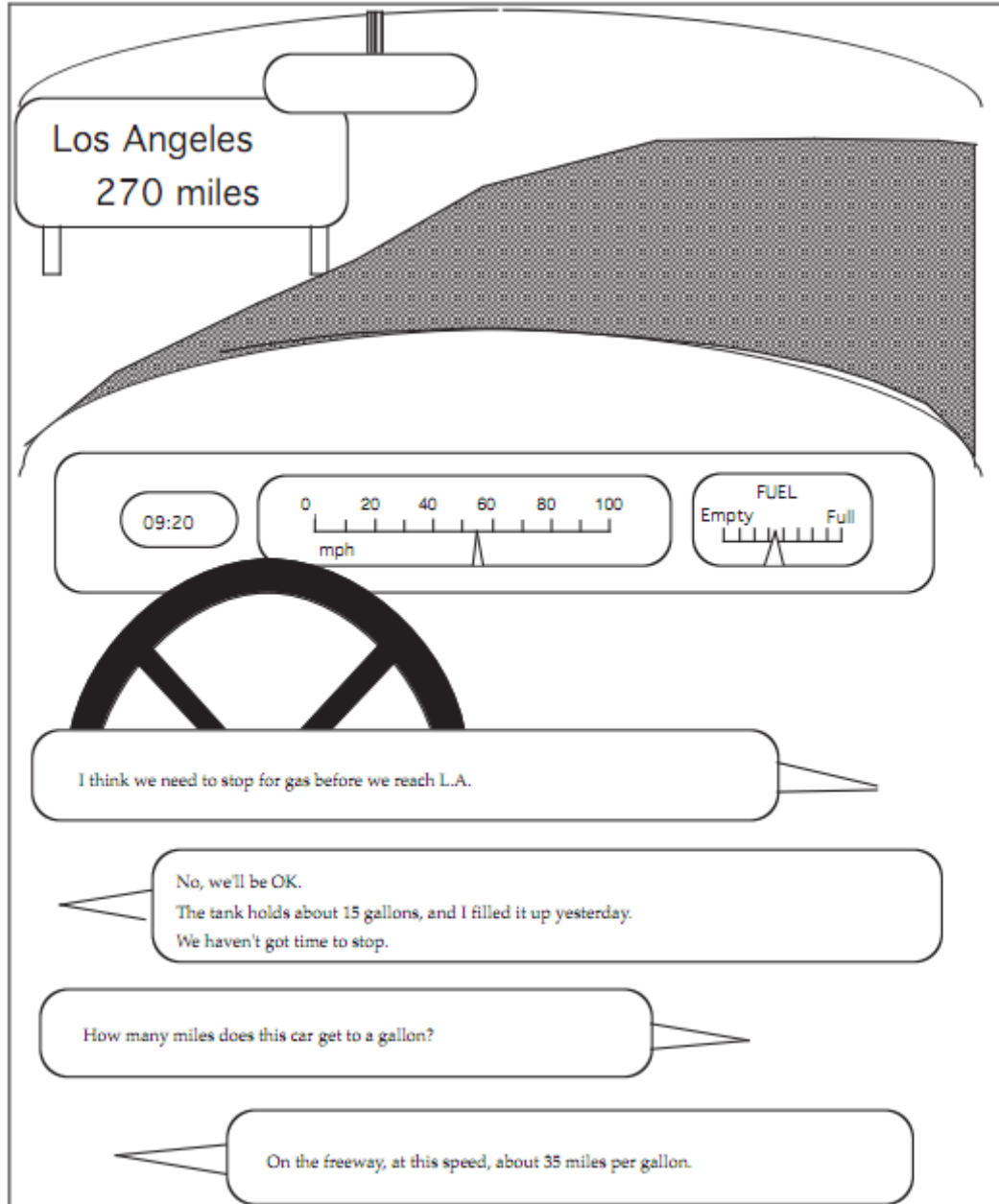
Karnataka is a state in southwest India. The accompanying table is agricultural data on fertilizer use and grain crop yield in Karnataka. Fertilizer is measured in 100,000 tons. Crop yield is measure in 10 kilograms per hectare.

Throughout the years over which these data were gathered, the amount of land in cultivation remained fairly constant.

- Write a mathematical function that models the relationship between fertilizer use and grain crop yield. Show your work.
- Use the function you have chosen to predict the yield if the fertilizer use is 500,000 tons.
- How precise is the prediction you made in Question (b)? Explain.
- Based on the data and your function, what advice can you offer the government of Kamataka about fertilizer use?

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28. The figure shows a conversation between two friends in a car.



- Do they have to stop for gas? Explain your reasoning.
- Suppose they stop for gas and the stop takes 30 minutes. If they continue their trip at the same speed, what time will they reach Los Angeles?