Appendix B Example Mathematics Items

Example Mathematics Items

Grade 4

1

Here is a number pattern.

100, 1, 99, 2, 98, ☐, ☐, ☐

What three numbers should go in the boxes?

*Ⓐ 3, 97, 4

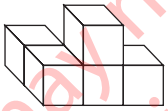
Ⓑ 4, 97, 5

Ⓒ 97, 3, 96

Ⓓ 97, 4, 96

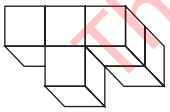
2

This figure will be turned to a different position.

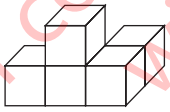


Which of these could be the figure after it is turned?

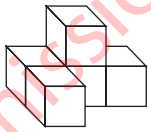
*Ⓐ



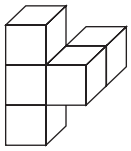
Ⓑ



Ⓒ



Ⓓ



*Correct Answer

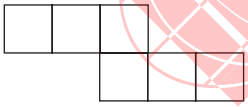
3

Which of these figures has the largest area?

Ⓐ 

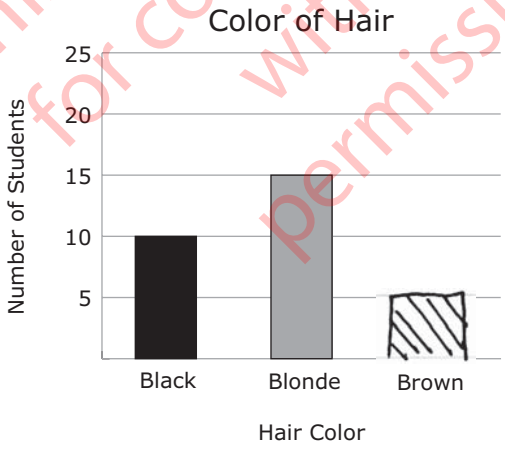
Ⓑ 

* Ⓒ 

Ⓓ 

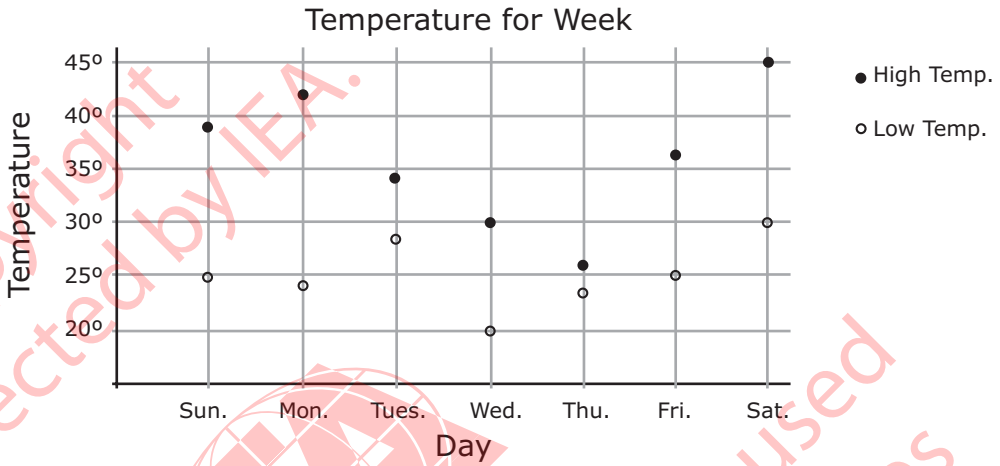
4

In a class of 30 students, 10 have black hair, 15 have blonde hair, and the rest have brown hair. Complete the graph below to show the number of students with brown hair.



*Correct Answer

5



The graph above shows the daily high and low temperatures for a week.

On which day is the difference between the high and low temperatures the greatest?

*Ⓐ Monday

Ⓑ Thursday

Ⓒ Friday

Ⓓ Saturday

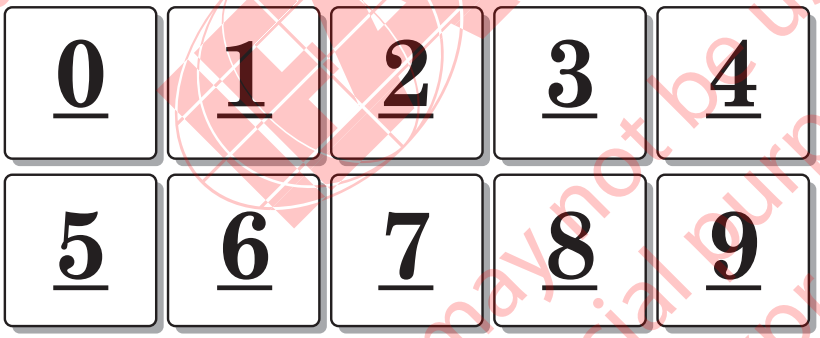
*Correct Answer

Number Tiles

Instructions: Questions **6**, **7**, **8** are about Number Tiles. To answer these questions you may refer to any information shown on the pages in the Number Tiles section.

For this item, you have been given a piece of cardboard with 10 square number tiles like the ones shown below. Take the piece of cardboard and punch out the 10 tiles.

If you do not have the piece of cardboard raise your hand.



Questions for Number Tiles begin on the next page.

Get to 20 Number Game

Two children, Joan and Herbert, are learning to play a game "Get to 20." Here are the rules for the game.

GET TO 20
RULES

Pick Tiles: Each player draws three number tiles.

Add Tiles: Each player places the three tiles to make an addition problem with the sum total closest to 20.

For example, here are four ways a player who draws [1], [4], and [5] could place the tiles:

$$\begin{array}{r} 5\,1 \\ +\,4 \\ \hline 55 \end{array} \quad \textbf{or} \quad \begin{array}{r} 4\,5 \\ +\,1 \\ \hline 46 \end{array} \quad \textbf{or} \quad \begin{array}{r} 1\,5 \\ +\,4 \\ \hline 19 \end{array} \quad \textbf{or} \quad \begin{array}{r} 1 \\ 5 \\ +\,4 \\ \hline 10 \end{array}$$

This player should choose to show the addition problem $\begin{array}{r} 15 \\ +4 \\ \hline 19 \end{array}$ because 19 is the total closest to 20.

This Number Tiles question continues on the next page.

6

Joan and Herbert played the game "Get to 20."

Joan picked [2], [7], and [9]. Herbert picked [1], [3], and [6].

A. What is the addition problem that Joan could make with her number tiles that gives a total closest to 20? Be sure to include the total.

2
+ 7
+ 9
18

that would be the closest

B. What is the addition problem that Herbert could make with his number tiles that gives a total closest to 20? Be sure to include the total.

13
+ 6
19

that would be the closest

C. Herbert said, "If I pick [1], [4], and [6], I can make 20 two different ways."

Show two ways Herbert could make 20 with [1], [4], and [6].

First way:

14
+ 6
20

Second way:

16
+ 4
20

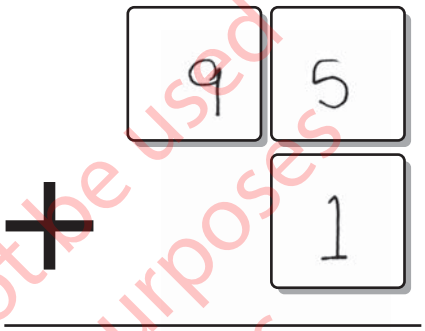
Questions for Number Tiles continue.

Finding the Largest Number Game

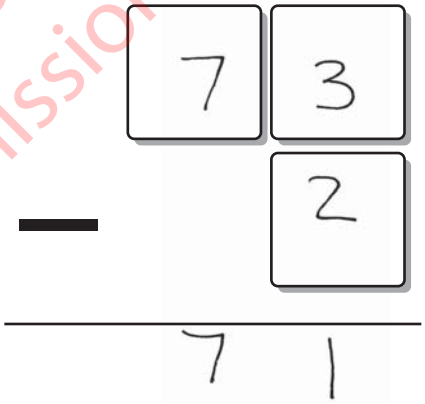
7

Using the number tiles, Joan and Herbert played a new game. They placed the numbers to make the largest answer.

A. Use the tiles [1], [5], and [9]. Write the numbers on the tiles in the boxes below to make the largest answer when you add.



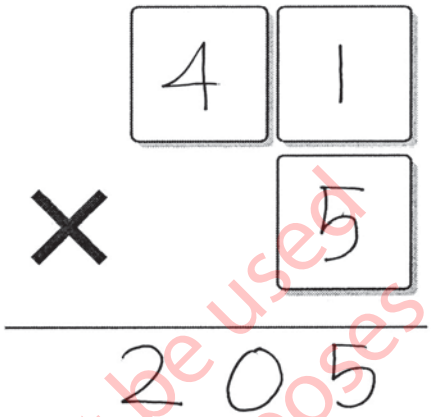
B. Use the tiles [2], [3], and [7]. Write the numbers on the tiles in the boxes below to make the largest answer when you subtract.



This Number Tiles question continues on the next page.

8

C. Use the tiles [1], [4], and [5]. Write the numbers on the tiles in the boxes below to make the largest answer when you multiply.



End of Number Tiles section.

Example Mathematics Items

Grade 8

1

If n is a negative integer, which of these is the largest number?

Ⓐ $3 + n$

Ⓑ $3 \times n$

*Ⓒ $3 - n$

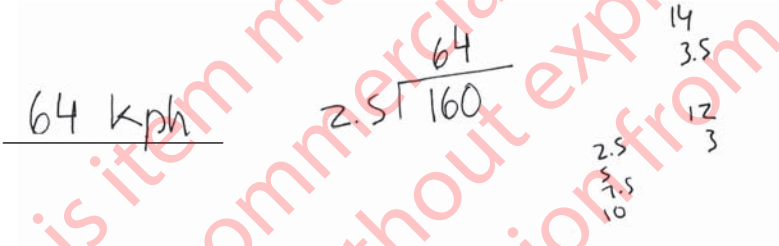
Ⓓ $3 \div n$

2

In a car rally two checkpoints are 160 km apart. Drivers must travel from one checkpoint to the other in exactly 2.5 hours to earn maximum points.

A. What must the average speed be to travel the 160 km in this time?

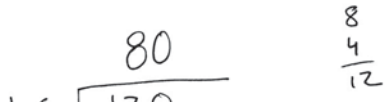
Answer: 64 kph

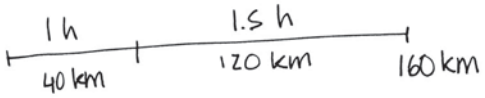


B. A driver took 1 hour to travel through a 40 km hilly section at the beginning of the course.

What must the average speed, in kilometers per hour, be for the remaining 120 km if the total time between checkpoints is to be 2.5 hours?

Answer: 80 kph





*Correct Answer

3

The three figures below are divided into small congruent triangles.

Figure 1

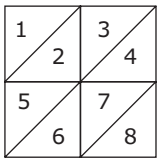


Figure 2

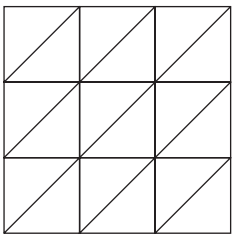


Figure 3

A. Complete the table below. First, fill in how many small triangles make up Figure 3. Then, find the number of small triangles that would be needed for the 4th figure if the sequence of figures is extended.

Figure	Number of Small Triangles
1	2
2	8
3	18
4	32

B. The sequence of figures is extended to the 7th figure. How many small triangles would be needed for Figure 7?

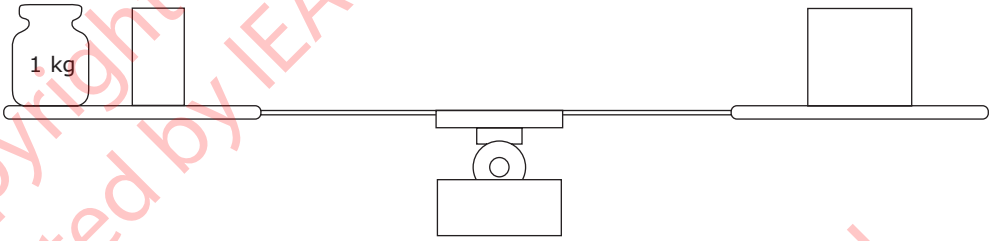
Answer: 98

C. The sequence of figures is extended to the 50th figure. Explain a way to find the number of small triangles in the 50th figure that does not involve drawing it and counting the number of triangles.

multiply the figure by itself and then multiply the answer you get by two.

4

The objects on the scale make it balance exactly. On the left pan there is a 1 kg weight (mass) and half a brick. On the right pan there is one brick.



What is the weight (mass) of one brick?

Ⓐ 0.5 kg

Ⓑ 1 kg

*Ⓒ 2 kg

Ⓓ 3 kg

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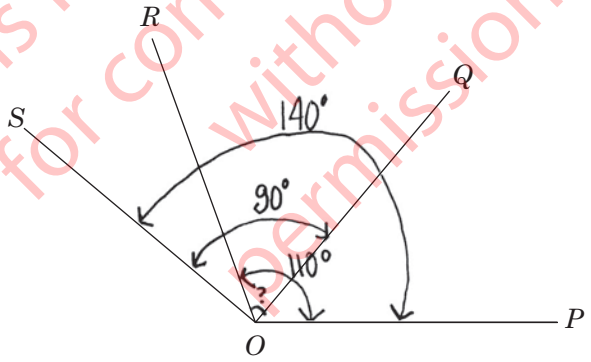
5

In the figure, the measure of $\angle POR$ is 110°, the measure of $\angle QOS$ is 90°, and the measure of $\angle POS$ is 140°.



What is the measure of $\angle QOR$?

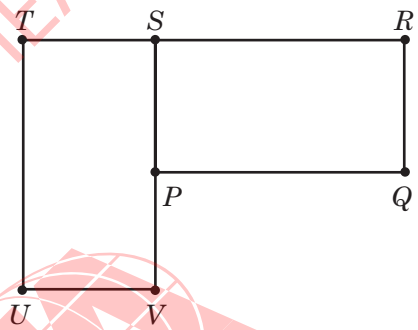
$140 - 110 = 30$
$90 - 30 = 60$

Answer: 60°

*Correct Answer

6

Rectangle $PQRS$ can be rotated (turned) onto rectangle $UVST$.



What point is the center of rotation?

Ⓐ P

Ⓑ R

*Ⓒ S

Ⓓ T

Ⓔ V

*Correct Answer

Phone Plans

Instructions: Questions 7, 8, 9 are about Phone Plans.
To answer these questions you may refer to any information shown on the pages in the Phone Plans section.

Betty, Frank, and Darlene have just moved to Zedland. They each need to get phone service. They received the following information from the telephone company about the two different phone plans it offers.

They must pay a set fee each month and there are different rates for each minute they talk. These rates depend on the time of the day or night they use the phone, and on which payment plan they choose. Both plans include time for which phone calls are free. Details of the two plans are shown in the table below.

Plan	Monthly Fee	Rate per minute		Free minutes per month
		Day (8 am – 6 pm)	Night (6 pm – 8 am)	
Plan A	20 zeds	3 zeds	1 zed	180
Plan B	15 zeds	2 zeds	2 zeds	120

7 Betty talks for less than 2 hours per month. Which plan would be less expensive for her?

Less expensive plan B

Explain your answer in terms of both the monthly fee and free minutes.

2 hours = 120 min. Only uses the free minutes
A: 20 + 0 = 20
B: 15 + 0 = 15 Cheaper

Questions for Phone Plans continue.

8

Frank talks for 5 hours per month at the night rate. What would each plan cost him per month? Show your work.

Cost Per Month for Plan A: 140 zeds

Cost Per Month for Plan B: 375 zeds

5 hrs = 5 x 60 = 300 min

A: 300 − 180 = 120 min
120 x 1 = 120 zeds
120 + 20 = 140 zeds.

B: 300 − 120 = 180 min
180 x 2 = 360 zeds.
360 + 15 = 375 zeds.

Questions for Phone Plans continue.

9 Darlene signed up for the *Plan B*, and the cost of one month of service was 75 zeds. How many minutes did she talk that month? Show your work.

Minutes talked 150

75 − 15 = 60 zeds
60 : 2 = 30 minutes
30 + 120 = 150 minutes

End of Phone Plans section.