EXAMPLE | What is the remainder when $30+31+32$ is divided by 7?

We first add $30+31+32$, then divide by 7 to find the remainder.
$30+31+32=93$.

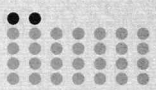
$$\begin{array}{r} 10+3 \\ 7\overline{)\,93} \\ -70 \\ \hline 23 \\ -21 \\ \hline 2 \end{array}$$

$93 \div 7$ has remainder **2**.

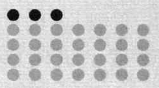
— *or* —

First, we find the remainder when each number is divided by 7.

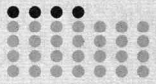
$30 \div 7$ has remainder 2.



$31 \div 7$ has remainder 3.



$32 \div 7$ has remainder 4.



Then, we add the remainders.
$(30+31+32) \div 7$ has the same remainder as $(2+3+4) \div 7$.

$2+3+4=9$, and $9 \div 7$ has remainder 2.
So, $(30+31+32) \div 7$ has remainder **2**.

PRACTICE | Find the ***remainder*** for each division problem below.

111. Alex has 74 green buttons and 75 blue buttons. When he arranges the buttons into rows of 7, how many buttons will be left over? **111.** _____

112. $(36+37) \div 5$ **113.** $(39+40) \div 6$ **112.** remainder = _____

113. remainder = _____

114. $(94+95+96) \div 9$ **115.** $(46+47+48) \div 4$ **114.** remainder = _____

115. remainder = _____

116. $(13+14+15) \div 12$ **117.** $(187+188+189) \div 75$ ★ **116.** remainder = _____

117. remainder = _____

EXAMPLE | What is the remainder when 10×18 is divided by 7?

We first multiply 10×18, then divide by 7 to find the remainder.
$10\times18=180$.

$$\begin{array}{r} 20+5 \\ 7\overline{)\,180} \\ -140 \\ \hline 40 \\ -35 \\ \hline 5 \end{array}$$

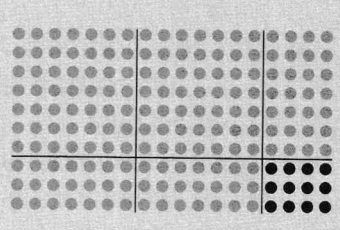
$180\div7$ has remainder **5**.

— ***or*** —

First, find the remainder when each number is divided by 7.

$10\div7$ has remainder 3.

$18\div7$ has remainder 4.



Then, we multiply the remainders.
$(10\times18)\div7$ has the same remainder as $(3\times4)\div7$.

$3\times4=12$, and $12\div7$ has remainder 5.
So, $(10\times18)\div7$ has remainder **5**.

PRACTICE | Find the ***remainder*** for each division problem below.

118. The Beast Bakery orders 12 boxes of 8 lemons to make pies. The bakers use 7 lemons in each pie. After they make as many pies as possible, how many lemons are left over?

118. _____

119. $(10\times11)\div8$

120. $(57\times58)\div6$

119. remainder = _____

120. remainder = _____

121. $(54\times55)\div53$

122. $(6\times7\times8)\div5$

121. remainder = _____

122. remainder = _____

123. $(11\times11\times11)\div9$

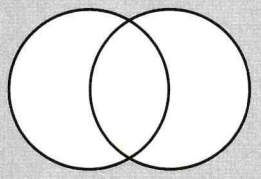
124. ★ $(103\times104\times105)\div100$

123. remainder = _____

124. remainder = _____

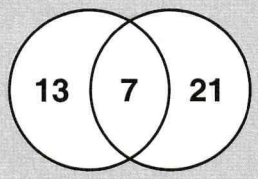
EXAMPLE Place the given numbers into the circle diagram so that the sum of the two numbers in each circle has remainder 0 when divided by 4.

Numbers to place: 7, 13, 21

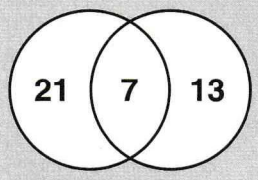


We can place the numbers as shown below:

The left circle contains 7 and 13.
$7+13=20$, which has remainder 0 when divided by 4.
The right circle contains 7 and 21.
$7+21=28$, which has remainder 0 when divided by 4.

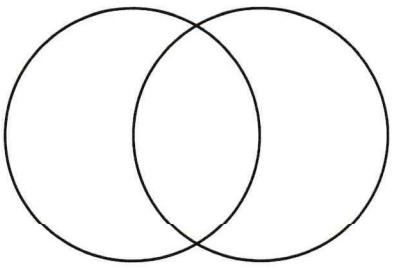


You may have switched the 13 and the 21, as shown.

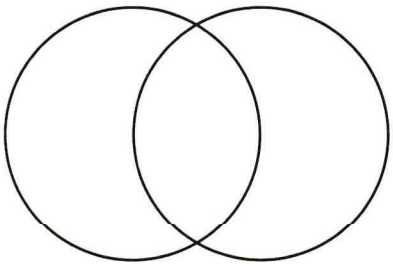


PRACTICE Place the given numbers into the circle diagram so that the sum of the two numbers in each circle has remainder 0 when divided by 5.

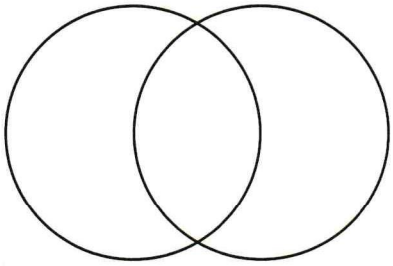
125. ***Numbers to place:*** 12, 17, 23



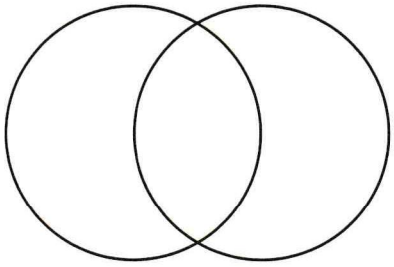
126. ***Numbers to place:*** 11, 24, 39



127. ***Numbers to place:*** 13, 23, 27

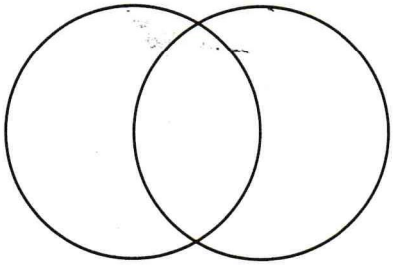


128. ***Numbers to place:*** 36, 31, 49

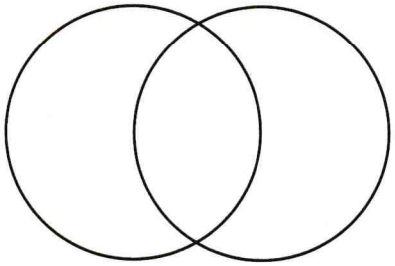


PRACTICE Place the given numbers into the circle diagram so that the sum of the two numbers in each circle has remainder 0 when divided by 8.

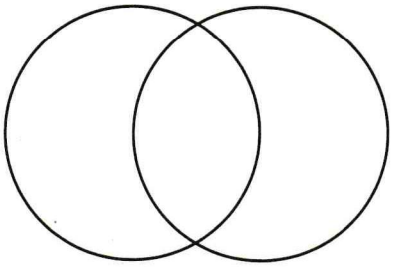
129. ***Numbers to place:*** 15, 23, 65



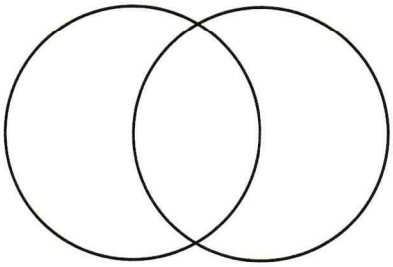
130. ***Numbers to place:*** 11, 21, 29



131. ***Numbers to place:*** 38, 46, 58

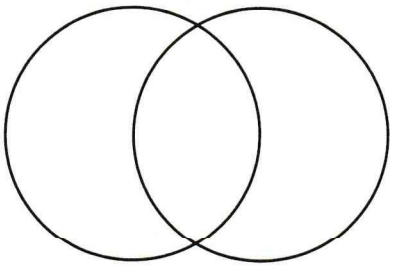


132. ***Numbers to place:*** 65, 73, 79

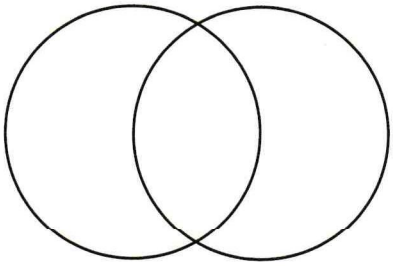


PRACTICE Place the given numbers into the circle diagram so that the sum of the two numbers in each circle has remainder ***3*** when divided by 7.

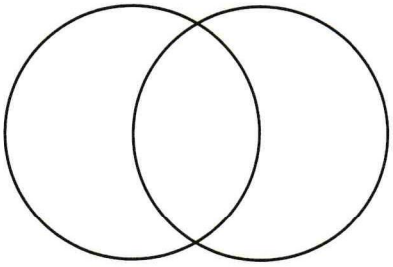
133. ***Numbers to place:*** 64, 71, 79



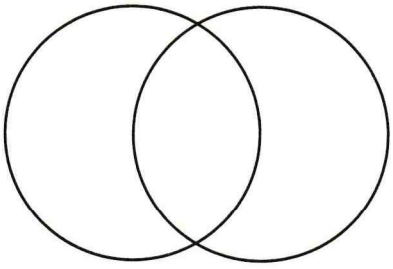
134. ***Numbers to place:*** 32, 48, 62



135. ***Numbers to place:*** 85, 93, 107



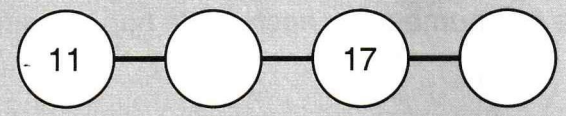
136. ***Numbers to place:*** 81, 95, 111



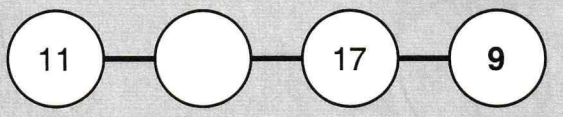
EXAMPLE

Complete each diagram with the given numbers so that no two connected circles have a sum that has remainder 0 when divided by 5.

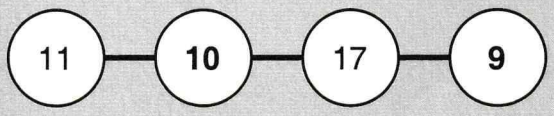
Missing Numbers: 9, 10



$9+11=20$, which has remainder 0 when divided by 5, so 9 cannot be placed in the empty circle next to 11. This leaves only one possible circle for the 9:



The 10 can be placed in the remaining circle.

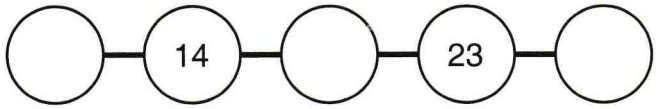


Each of $11+10$, $10+17$, and $17+9$ has a remainder that is not 0 when divided by 5.

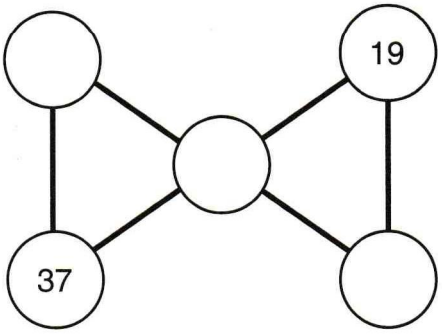
PRACTICE

Complete each diagram with the given numbers so that no two connected circles have a sum that has remainder 0 when divided by 10.

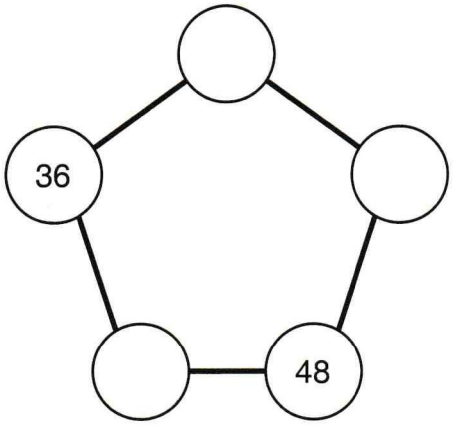
137. ***Missing Numbers:*** 15, 16, 17



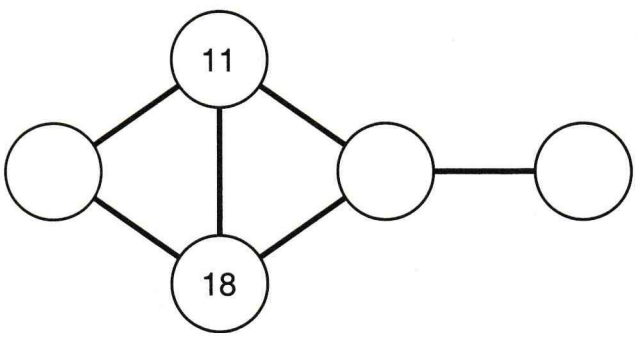
138. ***Missing Numbers:*** 21, 22, 23



139. ***Missing Numbers:*** 52, 53, 54

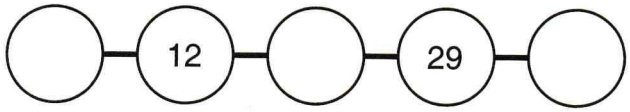


140. ***Missing Numbers:*** 19, 20, 21

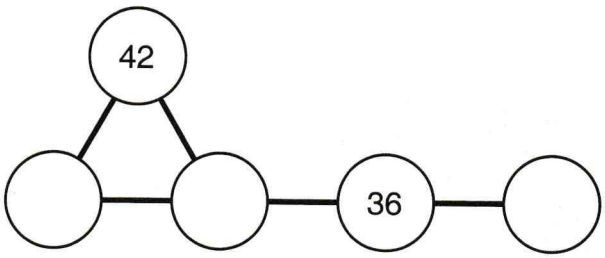


PRACTICE Complete each diagram with the given numbers so that no two connected circles have a sum that has remainder 0 when divided by 5.

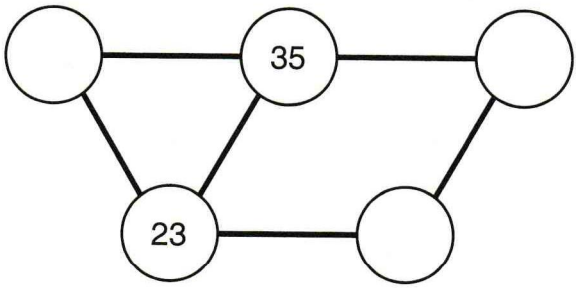
141. ***Missing Numbers:*** 26, 27, 28



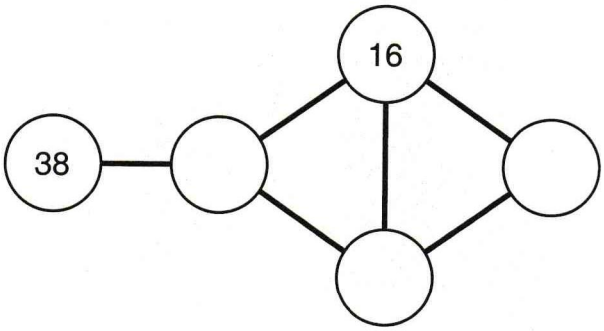
142. ***Missing Numbers:*** 32, 33, 34



143. ***Missing Numbers:*** 15, 16, 17

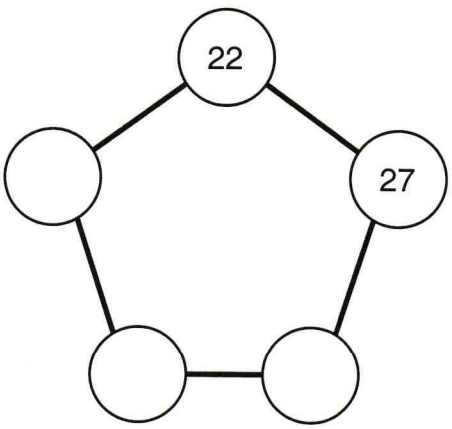


144. ★ ***Missing Numbers:*** 41, 42, 43

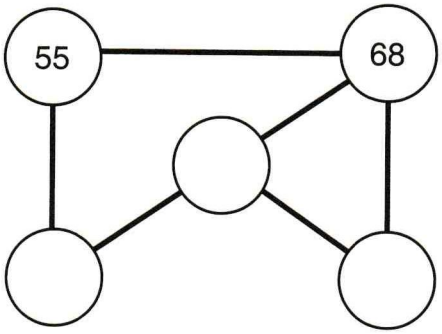


PRACTICE Complete each diagram with the given numbers so that no two connected circles have a sum that has remainder 0 when divided by 6.

145. ★ ***Missing Numbers:*** 32, 33, 34



146. ★ ***Missing Numbers:*** 71, 72, 73



PRACTICE

147. When 234 little monsters are divided equally into 9 classrooms, how many little monsters are in each classroom?

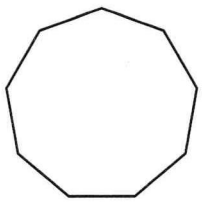
147. _____

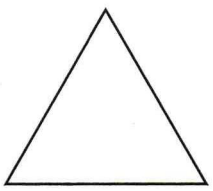
148. Lizzie has 7 pages of stickers, with 9 stickers on each page. If Lizzie divides her stickers equally onto 9 pages, how many stickers will there be on each page?

148. _____

149. A regular nonagon (9 sides) has sides of length 13. What is the side length of an equilateral triangle that has the same perimeter as the nonagon?

149. _____





150. Grogg has a box that contains only red and purple crayons. For every red crayon in the box, there are two purple crayons. If the box holds a total of 78 crayons, how many of the crayons are purple?

150. _____

151. Captain Kraken has 7 bags of rubies, with 36 rubies in each bag. If Captain Kraken divides his rubies equally among 4 treasure chests, how many rubies will there be in each chest?

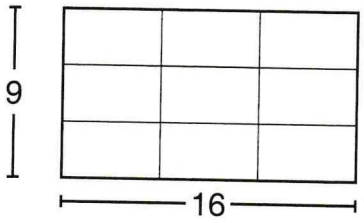
151. _____

152. Ms. Q. has 6 packs of pencils. Each pack contains 20 pencils. If Ms. Q. divides the pencils equally among the 17 students in her class, how many pencils will she have left over?

152. _____

153. A rectangle of width 16 and height 9 is divided into nine equal rectangles as shown below. What is the area of one of the small rectangles?

153. _____



154. Grogg can divide his gumballs into 6 piles, with 17 gumballs in each pile. If Grogg divides his gum into just 3 piles, how many gumballs will there be in each pile?

154. _____

155. When 78 blocks are stacked in piles of 7, they form 11 complete stacks with 1 block left over. If 78 blocks are stacked in piles of 14, how many blocks will be left over?

155. _____

156. Ms. Q. divides the students in her class into 7 teams, with 5 students on each team. She then divides 210 toothpicks equally among all of the students in her class. How many toothpicks does each student get?

156. _____

157. Grogg brings 50 blue, 58 purple, 66 green, and 74 pink popsicle sticks to art class. It takes 7 popsicle sticks to make a picture frame. How many popsicle sticks will be left over after Grogg makes as many picture frames as possible?

157. _____

158. ★ Alex is decorating cookies. Each cookie gets exactly 3 chocolate chips and 4 cinnamon candies. Alex has 100 chocolate chips and 125 cinnamon candies. How many cookies can Alex decorate?

158. _____

159. ★ One school bus can hold 40 little monsters. How many buses are needed to take 223 little monsters on a field trip?

159. _____

160. ★ When 41 is divided by 7, the quotient is a with remainder b. What number can be divided by 7 to get quotient b with remainder a?

160. _____

161. ★ There are 366 days in a leap year. Kara was born Sunday, January 1st during a leap year. On which day of the week will Kara celebrate her first birthday?

161. _____

162. ★ Grogg writes his name many times all over a sheet of paper. When he is finished, he counts 162 G's on the sheet. How many O's are on the sheet of paper?

162. _____