Year 6 Problem Solving Part 2

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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4 Problem Solving Part 4

4.1 Clock Problem

Example 4.1.1 A certain clock loses two minutes of time every hour. If the clock shows the correct time now, in how many hours will it next show the correct time again without regard to am. or p.m.?

Solution: *For an extreme case: the slow clock has stopped and not keeping time at all.*
It will therefore shows the correct time only once in every twelve-hour interval.
In this problem the clock must then lose equivalent of twelve hours before it once again shows the correct time.
How many hours will this take? Twelve hours contain $12 \times 60 = 720$ *minutes.*
Since the clock loses two minutes in one hour, it will lose 720 minutes in $720 \div 2 = 360$ *hours.*
Therefore the clock will show the correct time again in 360 hours, or in 15 days.

Exercise 4.1.1 Suppose that a clock shows the correct time now. Under each of the following conditions, when will it show the correct time again?

1. *It gains one minute every hour.*

2. *It loses three minutes every hour.*

3. *It gains five seconds every hour.*

Example 4.1.2 A certain clock loses six minutes every hour. One day this clock is set to the correct time at 12:30 p.m. What will be the correct time when the clock first shows 2:00 p.m. on the same day?

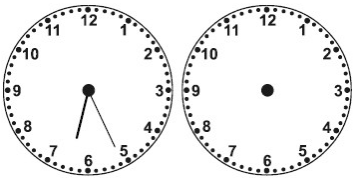
Solution: *The correct clock has 60 min each hour, while the fast clock has 54 min each hour.*
The ratio of minutes has passed for the correct clock to the slow clock is: $C : S = 60 : 54$
From 12:30 p.m. to 2:00 p.m. there are 90 minutes for the slow clock.
For the correct clock $C : 90 = 60 : 54 \Rightarrow C = \frac{60 \times 90}{54} = 100$ *min, or 1 hr and 40 min.*
Therefore the correct time should be $12 : 30\, p.m. + 1 : 40 = 2 : 10\, p.m.$

Exercise 4.1.2

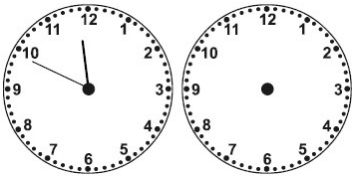
1. *The time is* $6 : 24$*. What is the angle of the hour hand and minute hand?*

2. *The time is 3:40. What is the angle between the hour hand and minute hand?*

3. *What time was it 2 hours 47 minutes ago?*



4. *What time was it 4 hours 49 minutes ago?*



4.2 Book Problem

Example 4.2.1 Suppose that a printer is using an old style printing press and needs one piece of type for each digit in the page number of a book. How many pieces of type will the printer need to number pages from 1 to 300?

Solution: *How many one-digit page numbers are there? there are 9.*
How many two digit page numbers are there? From 10 through to 99 there are:
$90 \times 2 = 180$ *pieces of type.*
How many three-digit numbers are there? From 100 to 300 there are:
$201 \times 3 = 603$ *pieces of type.*
Therefore the total numbers of type is $9 + 180 + 603 = 792$.

Exercise 4.2.1 Suppose that a printer is using an old style printing press and needs one piece of type for each digit in the page number of a book. A certain book contains 320 pages.

1. *How many pieces of type will the printer need to number this book?*

2. *How many 5s will the printer need?*

3. *How many 8s will the printer need?*

4.3 Number Problem

Example 4.3.1 If $A \spadesuit B = (A \times 3 + B) \times \frac{1}{3}$, then $\square \spadesuit \frac{2}{3} = \frac{1}{3}$. Find the missing number.

Solution: $\square \spadesuit \frac{2}{3} = (\square \times 3 + \frac{2}{3}) \times \frac{1}{3} = \frac{1}{3} \Rightarrow \frac{1}{3} \times (3\square + \frac{2}{3}) = \frac{1}{3}$,
$\square + \frac{2}{9} = \frac{1}{3} \Rightarrow \square = \frac{1}{3} - \frac{2}{9} = \frac{3}{9} - \frac{2}{9} = \frac{1}{9}$.

Exercise 4.3.1

1. *Joe wants to multiply a number by 25, but divided by 25 instead. His answer was 52. What should his answer have been?*

2. *Four consecutive odd numbers add up to 56. What are the numbers?*

3. *How many even numbers between 10 and 151 are multiplies of 3?*

4.4 Boundary Problem

Example 4.4.1 Cathy has a table cloth that fits on a rectangular table which is 0.8 m by 1.6 m. The cloth covers the table completely with 20 cm hanging over each edge. Cathy wants to put a lace border on its edge. What is the length of the lace she needs?

Solution: *The dimension of the table cloth is* $1.2\,m$ *by* $2.0\,m$.
So the length of the lace is $P = (1.2 + 2.0) \times 2 = 4.4\,m$.

Exercise 4.4.1

1. *A lawn is a the shape of a triangle with sides of 12 m and 18 m and 24 m. A post is planted at three-metre intervals along the perimeter of the lawn. If a sign is placed on each post except those at the corners, how many signs are around the triangle?*

2. *A farmer plans to build a rectangular paddock for his sheep with one existing wall. He has 50 metres building mertieral. What is the maximum area of of the paddock?*

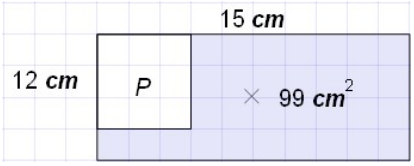
3. *A student draws a rectangle with a perimeter of 26 cm and with sides whose lengths are whole numbers. What would be the greatest possible area that this rectangle could have?*

Exercise 4.4.2

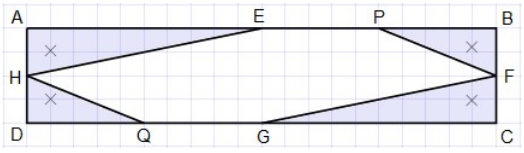
1. *A square has an area of* $540\,cm^2$*. A small square is cut from the large square. The small square has all the sides that are just one third of the large square. What is the area of the small square?*

2. *If one square has three times the perimeter of another, how much larger is its area?*

3. *A square P is cut off from a rectangular piece of cardboard ABCD which measures 12 cm by 15 cm. The area of the shaded part is* $99\,cm^2$*. Find the perimeter of the square P.*



4. *ABCD is a rectangle, and E,F,G,H are midpoints of sides AB, BC, CD and AD respectively. Also P, Q are the midpoints of EB and and DG respectively. What fraction of the unshaded area is the shaded area?*



4.5 Quiz

Question 1 . . . . . *(5 marks)*

At which hour do the hands of a clock form an angle that measures $120°$?

Question 2 . . . . . *(5 marks)*

At which hour do the hands of a clock form an angle that measures $60°$?

Question 3 . . . . . *(5 marks)*

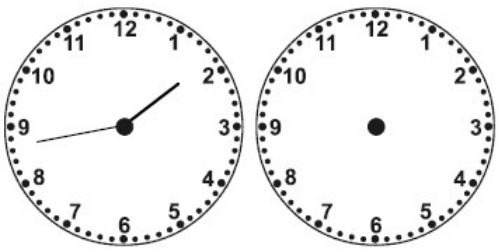
The time is 5:50. What is the angle between the hour hand and minute hand?

Question 4 . . . . . *(5 marks)*

At what time between 3 p.m. and 4 p.m.is the first right angle?

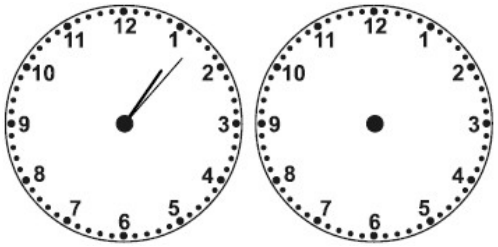
Question 5 . . . . . *(5 marks)*

What time will it be in 4 hours 23 minutes?



Question 6 . . . . . *(5 marks)*

What time will it be in 2 hours 57 minutes?



Question 7 . . . . . *(5 marks)*

If a printer uses a total of 384 pieces of type numbering the pages of a certain book, how many numbered pages does this book contain?

Question 8 . . . . . *(5 marks)*

One section of a certain book contains 5 pages. The sum of all the pages in this section is 325. What are the page numbers?

Question 9 . . . . . *(5 marks)*

A plane due at 7:20 a.m. arrived 42 minutes early. What time did it arrive?

Question 10 . . . . . *(5 marks)*

The time is now 11:33 a.m. What time will it be in 3 hours and 42 minutes?

Question 11 . . . . . *(5 marks)*

The time is now 10:14 a.m. What time was it 3 hours and 25 minutes ago?

Question 12 . . . . . *(5 marks)*

What is angle between the two hands of a clock at 20:00?

Question 13 . . . . . *(5 marks)*

A school excursion to Toronga Zoo began at 8:25 a.m. It ended at 3:15 p.m. How long did it last?

Question 14 . . . . . *(5 marks)*

Here is a number sentence. $\frac{\boxed{?}}{10}$ is greater than $\frac{2}{\boxed{?}}$. What is the smallest number that could go in both boxes to make the number sentence true?

Question 15 ..... *(5 marks)*

What number should be in the box to make this statement true? $\frac{34+\boxed{?}}{207} = \frac{2}{9}$

Question 16 ..... *(5 marks)*

The area of a square and a rectangle are the same. If the square has sides of 16 cm, and the ratio of the length to the width of the rectangle is 4: 1, what is the perimeter of the rectangle?

Question 17 ..... *(10 marks)*

Suppose that a clock shows the correct time now. When will it show the correct time again if loses five seconds every 2 hours?

Question 18 ..... *(10 marks)*

The same number is multiplied by both $\frac{3}{16}$ and $\frac{5}{24}$. For the fractions to become whole numbers. Find the least number.