P5 syllabus (Calculators Allowed)

Numeration
Number notation and place values, including decimals and fractions
Application of factors and multiples in problem solving
Numerical manipulations
Solving word problems involving the 4 operations, including order of operations

Percentage
Percentage as part of a whole
Fractions and decimals as percentages and vice versa
Exclude: Expressing one quantity as a percentage of another; comparison of two quantities by percentage
Solving word problems involving percentage

Ratio
Expressing a ratio on its simplest form
Solving word problems involving ratio of two or three given quantities, their sum or difference, before and after change
Exclude ratios involving fractions and decimals

Measurement
Time in years, months, weeks, days, hours, minutes and seconds, 24-hour clock
Area and Perimeter of composite figures
Length, mass and volume of cuboids
Area of triangle (exclude finding the base/height of a triangle given its area)
Volume of cube and cuboid
Spatial visualisation

Geometry
Properties of angles
Angles and properties of triangles, parallelogram, rhombus and trapezium
Exclude: geometrical construction involving use of compasses; exterior angles
Symmetry

Data Analysis
Interpreting data from tables, bar charts and line graphs
Average

Logic
Inferring and deducing relationships between objects given a set of clues

Combinatorics
Finding largest, smallest or optimal number of options satisfying certain criteria, deciding when the criteria can be met.

		Topics	Total marks	Question Numbers
1 to 10	2 marks	Numeration	19	24, 16, 11, 1
11 to 20	4 marks	Fractions, Decimals	12	21, 15, 9
21	6 marks	Percentage	10	20, 14, 8
22	7 marks	Ratio	13	22, 13, 7
23	8 marks	Measurement	6	19, 6
24	9 marks	Geometry	6	18, 5
25	10 marks	Data Analysis	6	17, 4
		Logic	14	23, 12, 3
		Combinatorics	14	25, 10, 2

P5

1. Given that $3^2 = 3 \times 3$ and $3^3 = 3 \times 3 \times 3$, what is the last digit of the answer for 6^{32}?

When 6 is multiplied with any number that ends in 6, the answer always ends with the digit 6.

2. I have 5 similar cups of 5 different colours – Red, Blue, Green, Yellow and Orange.
   I also have 3 similar saucers of 3 different colours – White, Black and Purple.
   How many different ways can I choose 2 sets of cups and saucers?

There are $\frac{5\times4}{2\times1}$ = 10 ways to choose 2 cups.

There are $\frac{3\times2}{2\times1}$ = 3 ways to choose 2 saucers.

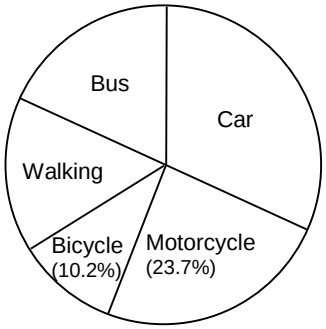
Altogether there are 10 × 3 = 30 different ways to choose 2 sets of cups and saucers.

3. In an aquarium, each shrimp can see an equal number of other shrimps and seahorses but each seahorse can see twice as many shrimps as other seahorses. How many shrimps and how many seahorses are there in the aquarium?

There are 4 shrimps and 3 seahorses.
Each shrimp will see 3 other shrimps and 3 seahorses, hence equal number of each.
Each seahorse will see 2 other seahorses and 4 shrimps, hence twice as many shrimps.

4. Study the given Pie-chart. What is the difference in the percentage of students who went to school on a motorized vehicle and those who did not?

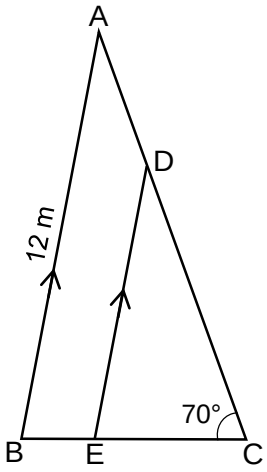
By motorized vehicle → Bus, Car and Motorcycle
→ 50% + 23.7% = 73.7%
Not by motorized vehicle → 100% – 73.7% = 26.3%
Difference = 73.7% – 26.3% = 47.4%



5. In the given figure not drawn to scale, DC = 2 × AD, and AB = 12 m.
   Find the length of DE.

Since CD is $\frac{2}{3}$ of AC, then
DE = $\frac{2}{3}$ of AB

= $\frac{2}{3}$ of 12 = 8 m



6. What is the date that is in the middle of the whole year of 2017?

The date that is in the middle is the 183rd day of the year.
There are 181 days from January to June. Hence, the 183rd day of the year is 2 July 2017.

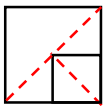
7. It takes 4 chefs 3 hours to prepare a banquet. How long will it take 6 chefs to prepare the banquet if all the chefs are working at the same rate?

It takes 4 chefs, 3 hours to prepare the banquet.
It will take 12 chefs 1 hour to prepare the banquet.
It will take 6 chefs 2 hours to prepare the banquet.

8. Five people are lined up according to their height. The first person is 1.8 m tall. Each subsequent person is 10% shorter than the person before. What is the height of the last person? Round off your answer to 2 decimal places.

0.9 of (0.9 of (0.9 of (0.9 of 1.8)))
= 0.9 of (0.9 of (0.9 of 1.62))
= 0.9 of (0.9 of 1.458)
= 0.9 of 1.3122
= 1.181
Height of last person is 1.18 m (2 decimal places)

9. If the diagonal of a large square is twice as long as the diagonal of a small square, express the area of the small square as a fraction of the area of the large square.



The area of the small square is $\frac{1}{4}$ of the area of the large area.

10. The digit-sum of a number is the sum of the all the digits that make up the number. For example, the digit sum of 98 is 9 + 8 = 17.
How many whole numbers from 20 to 200 have an even digit-sum?

There are 200 – 19 = 181 numbers from 20 to 200.
From 20 to 199, there is an equal number of odd and even digit sums.
The number 200 has an even digit sum. Therefore, there is 1 more even digit-sum than odd digit-sum for numbers from 20 to 200. Therefore, there are 91 numbers with even digit-sums.

11. The product of two numbers is 756. If one of the numbers is between 55 and 83, what is the other number?

Prime factorization of 756 = 2 × 2 × 3 × 3 × 3 × 7
= 63 × 12
The number between 55 and 83 is 63. The other number is 12.

12. Three gifted musicians, Thomas, Harry and Johnny, can play any of three instruments – the guitar, the flute and the piano. The three of them are deciding who will play which instrument for tonight's performance.

    If Thomas plays the flute, Harry will play the guitar.
    If Thomas plays the piano, Harry will play the guitar.
    If Harry plays either the flute or the guitar, Johnny will not play the piano.
    If Johnny does not play the piano, Thomas will also not want to play the piano.

    Fill in the following blanks in the answer sheet:

    Who is playing which instrument tonight?

    Thomas will play the ___guitar_____.

    Harry will play the ____piano_____.

    Johnny will play the ___flute_____.

Since Johnny will not play the piano if Harry plays the flute or the guitar; and Thomas will not want to play the piano if Johnny doesn't, then Harry has to play the piano.

Since Harry is not playing the guitar, Thomas is not playing the flute, hence, he will play the guitar. This leaves Johnny to play the flute.

13. There are thrice as many apples in Bag A as Bag B. There are twice as many green apples as red apples in each bag. The average mass of each green apple is 0.6 kg while the average mass of each red apple is 0.8 kg. If the total mass of all the apples from both bags is 96 kg, how many red apples are there in Bag A?

		A	:			B	
		3	:			1	
		9	:			3	
$Green_A$	:	Red_A	:		$Green_B$	:	Red_B
6	:	3	:		2	:	1

6 + 2 = 8 units of green apples → 8 × 0.6 = 4.8 kg
3 + 1 = 4 units of red apples → 4 × 0.8 = 3.2 kg
1 unit → 96 ÷ (4.8 + 3.2) = 96 ÷ 8 = 12 apples
There are 3 units of red apples in Bag A.
Hence, there are 12 × 3 = 36 red apples in Bag A.

14. In an examination taken by 4000 candidates, 2200 of them were boys and the rest were girls. If 45.5% of the students passed and 40% of the girls passed, what percentage of the boys passed?

45.5% of 4000 = 1820
40% of (4000 – 2200) = 720 girls passed
1820 – 720 = 1100 boys passed
1100 out of 2200 boys = 50% of the boys passed

15. Ted has thrice as many gummy bears as Esther.
He gave 189 gummy bears to Esther.
Esther then gave $\frac{1}{3}$ of her gummy bears to her sisters.
Now Esther has the same number of gummy bears as Ted.
How many gummy bears does Esther have in the end?

$\frac{2}{3}$ (1 unit + 189) = 3 units – 189

$\frac{2}{3}$ unit + 126 = 3 units – 189

$\frac{7}{3}$ units = 315

$\frac{1}{3}$ units = 45

1 unit = 135

3 units – 189 = 216
Esther has 216 gummy bears in the end.

16. I am thinking of a number. The sum of its digits is 6 and none of its digits is 0.
When I add 20 to the number, the answer is an even number.
When I add 21 to the number, it becomes a multiple of 111.
What number am I thinking of?

Possible numbers with digit sum of 6 are:
15, 51, 24, 42, 33
114, 141, 411, 123, 132, 213, 231, 312, 321, 222

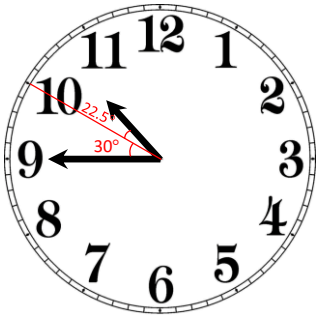
If the answer is even after adding 20, the original number is also even.
Hence, the possible numbers are now:
24, 42, 114, 132, 222, 312

Only 312 when added with 21, becomes a multiple of 111.

17. The average of 77 consecutive numbers is 77. What is the average of the seven largest of these numbers?

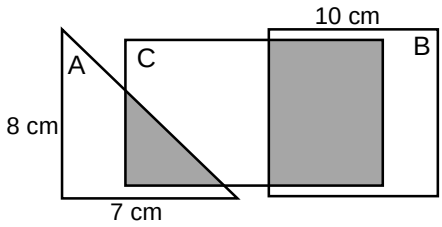
For the average of 77 consecutive numbers to be 77, there are 38 numbers greater than 77 and 38 numbers less than 77. The largest of these numbers is 77 + 38 = 115.
The seven numbers are 115 + 114 + 113 + 112 + 111 + 110 + 109
The average of these seven consecutive numbers is the number in the middle, which is 112.

18. When the time on the clock is exactly 3 o'clock, the minute hand and the hour hand form a right angle. What is the acute angle between the two hands at 10:45?



The hour hand moves 360 ÷ 12 ÷ 60 = 0.5° per minute
In 45 minutes, it moves 22.5°
At 10:45, the minute hand is at 9 and the hour hand is between10 and 11.
Hence, the angle between them is 30° + 22.5° = 52.5°

19. Triangle A is a right-angled triangle. One side of it is 7 cm and the other side is 8 cm. The length of the side of Square B is 10 cm. The total area of the shaded parts is 60 cm^2. The total area of the figure is 200 cm^2.
What is the area of Rectangle C?



Unshaded part of rectangle = 200 – (28 + 100) = 72 cm^2
Shaded parts of rectangle = 60 cm^2
Total area of rectangle = 60 + 72 = 132 cm^2

20. A square game board has dark squares at its four corners, then alternating with light squares throughout the board. There are 4% fewer light squares than dark squares. If the length of each square is 1 unit, what is the length of one side of the game board?

The game board has 1 less light squares than dark squares.
Therefore, dark squares → 100% and light squares → 96%
1 square → 4%
196% → 49 squares
The game board is 7 squares by 7 squares.
Length of one side of the game board is 7 units.

21. Suriah made two fractions with all the digits from 0 to 9, using each digit once. The sum of the two fractions is exactly 1. If one of the fractions she made was $\frac{1}{2}$, using the digits 1 and 2, what is the digit sum of the numerator of other fraction that is made up of the remaining eight digits?

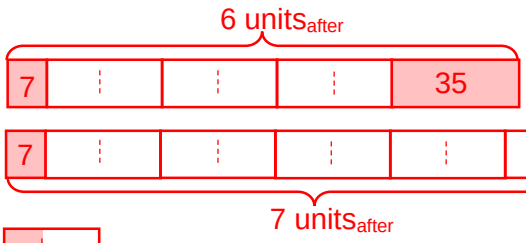
Ans : $\frac{4835}{9670}$ or $\frac{3548}{7096}$ or $\frac{4538}{9076}$ or $\frac{3845}{7690}$. The digit sum of the numerator is 20.

22. Alina and Adam had some stickers in the ratio of 3 : 5. When Alina bought 42 more stickers and Adam bought 7 more stickers, the ratio became 6 : 7. Find the number of stickers Alina had at first.

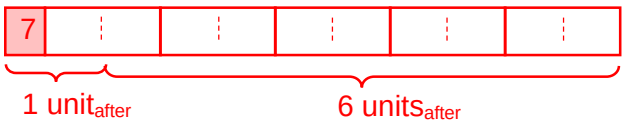
Before : Alina

Adam

Where 1 $unit_{before}$:



Where 1 $unit_{after}$: 7



Since 6 $units_{after}$ = 7 35

which is also =

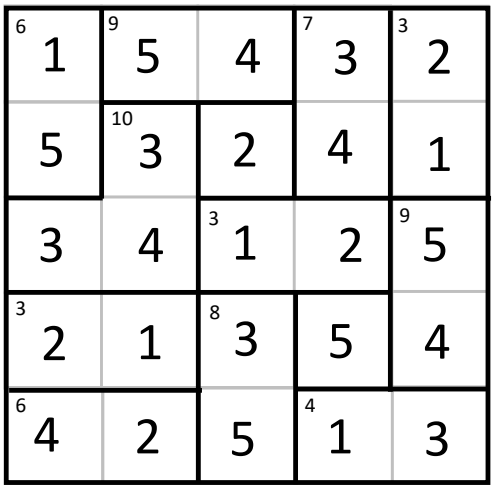
Then = 42

And = 14

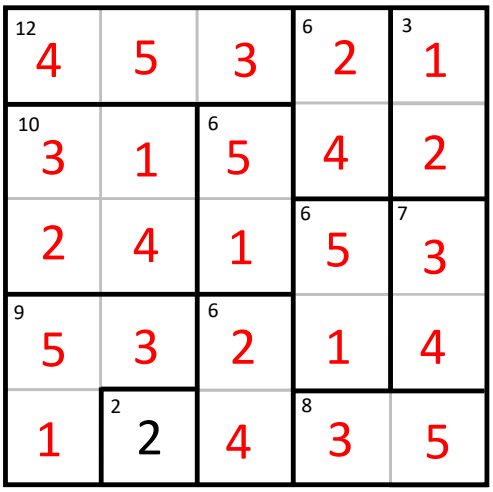
The number Alina had at first = = 14 × 6 = 84 stickers

23. In a KenKen 5-by-5 puzzle, the digits 1, 2, 3, 4 and 5, are used to fill the spaces in the grid so that no digit appears more than once in any row or any column, and the digits inside the cells (marked by darker lines) add up to the number given inside the cell.

Example:



For the puzzle below, one of the spaces has been filled for you. Fill in all the remaining spaces.



24. Given that $625^2 = 625 \times 625$ and $625^3 = 625 \times 625 \times 625$, what is the digit in the Ten Thousands place of the answer for 625^{11}?

$625^1 = 625$
$625^2 = 625 \times 625$

$$\begin{array}{r} 6\ 2\ 5 \\ \times\ 6\ 2\ 5 \\ \hline 3\ 1\ 2\ 5 \\ 1\ 2\ 5\ 0 \\ 3\ 7\ 5\ 0 \\ \hline 3\ 9\ 0\ 6\ 2\ 5 \end{array}$$

$625^3 = 625 \times 625 \times 625$

$$\begin{array}{r} 3\ 9\ 0\ 6\ 2\ 5 \\ \times\ 6\ 2\ 5 \\ \hline \ldots\ldots\ldots 5\ 3\ 1\ 2\ 5 \\ \ldots\ldots\ldots 1\ 2\ 5\ 0 \\ \ldots\ldots\ldots 3\ 7\ 5\ 0 \\ \hline \ldots\ldots\ldots 3\ 4\ 0\ 6\ 2\ 5 \end{array}$$

$625^4 = 625 \times 625 \times 625 \times 625$

$$\begin{array}{r} \ldots\ldots\ldots 3\ 4\ 0\ 6\ 2\ 5 \\ \times\ 6\ 2\ 5 \\ \hline \ldots\ldots\ldots\ldots 0\ 3\ 1\ 2\ 5 \\ \ldots\ldots\ldots\ldots 1\ 2\ 5\ 0 \\ \ldots\ldots\ldots 3\ 7\ 5\ 0 \\ \hline \ldots\ldots\ldots 9\ 9\ 0\ 6\ 2\ 5 \end{array}$$

The answers alternate between ending with …90625 and 40625.
Even powers → …90625
Odd powers → …40625

Therefore, the answer for 625^{11} will end with …40625.
The digit in the Ten Thousands place is 4.

25a) How many numbers are there between 2000 and 3000 where the digit in the Thousands place is equal to the sum of the other three digits?

The digit in the Thousands place is 2.
There are 6 ways to get the sum of 2 out of 3 digits
→ (0 + 0 + 2), (0 + 2 + 0), (2 + 0 + 0),
(0 + 1 + 1), (1 + 0 + 1), (1 + 1 + 0)
Hence, the numbers are 2002, 2020, 2200, 2011, 2101, 2110.
There are 6 numbers.

b) How many numbers are there between 6000 and 7000 where the digit in the Thousands place is equal to the sum of the other three digits?

The digit in the Thousands place is 6.
There are 28 ways to get the sum of 6 out of 3 digits
→ (0 + 0 + 6), (0 + 6 + 0), (6 + 0 + 0),
(0 + 1 + 5), (1 + 0 + 5), (1 + 5 + 0),
(0 + 5 + 1), (5 + 0 + 1), (5 + 1 + 0),
(0 + 2 + 4), (2 + 0 + 4), (2 + 4 + 0),
(0 + 4 + 2), (4 + 0 + 2), (4 + 2 + 0),
(0 + 3 + 3), (3 + 0 + 3), (3 + 3 + 0),
(1 + 1 + 4), (1 + 4 + 1), (4 + 1 + 1),
(1 + 2 + 3), (1 + 3 + 2), (2 + 1 + 3), (2 + 3 + 1), (3 + 1 + 2), (3 + 2 + 1)
(2 + 2 + 2)

Hence the numbers are 6006, 6060, 6600
6015, 6105, 6150
6051, 6501, 6510
6024, 6204, 6240
6042, 6402, 6420
6033, 6303, 6330
6114, 6141, 6411,
6123, 6132, 6213, 6231, 6312, 6321
6222

There are 28 numbers.