TERM 3 MATHEMATICS
NUMERIC AND GEOMETRIC PATTERNS

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NUMBER PATTERNS

Patterns are an arrangement of shapes and numbers. Rules are explanations of how a pattern is arranged. Term is a number or combination of a number and variables in a numerical pattern or mathematical expression.

You have learnt about numbers and their relationships. Now you will identify, describe and extend patterns using numbers and geometric shapes and you will work with rules to define a pattern to formulate rules from a given pattern, e.g. 1; 5; 9; 13…. form a pattern. Each number in the pattern is called a term. The first term in this pattern is 1 and the second term is 5. The dots after the number 13 tell you that the pattern continues beyond what is shown.

To form a pattern, you may add or subtract the same numbers repeatedly. This is called a constant difference. In some patterns you divide or multiply to extend the pattern and this is called a constant ratio.

**EXERCISE 1**

1. Write down the first 20 Natural Numbers.
2. Provide answers to the following:
   a. What are the 4th, 5th and 6th even numbers?
   b. What relationship is between an even number and its sequential position? (Describe the pattern)
   c. What will the fifteenth even number be?
   d. What are the 4th, 5th and 6th odd numbers?
   e. What relationship is between the odd numbers and their numerical positions? (Describe the pattern)
f. What will the 10\textsuperscript{th} odd number be?
g. What will be the 25\textsuperscript{th} odd number be?

**EXERCISE 2: TRIANGULAR NUMBERS**

The first 3 triangular numbers can be illustrated as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

1. Draw the next 5 triangular numbers.
2. How did you know what the next triangular number would be?
3. Complete the table below by filling in the triangular numbers:

<table>
<thead>
<tr>
<th>Sequence of numbers</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangular Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Write down the rules you would to determine what any given triangular number would be.
5. The triangular number is 28. What is the term?
6. The triangular number is 55. What is the term?

**EXERCISE 3: RECTANGULAR NUMBERS**

The first 3 rectangular numbers can be illustrated as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>
1. Draw the next 5 rectangular numbers.
2. How did you know what the next rectangular number would be?
3. Complete the table below by filling in the rectangular numbers:

<table>
<thead>
<tr>
<th>Term</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Write down the rule you would apply to determine what any given rectangular number would be.
5. Use this rule to determine:
   a. The 20th rectangular number
   b. The 25th rectangular number
6. a. What rule would you apply to work out the nth term?
   b. Use the rule to determine what the term would be if the rectangular number is:
      i. 72
      ii. 156

**EXERCISE 4: SQUARE NUMBERS**

The first 3 square numbers can be illustrated as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>
1. Draw the next 5 squares.
2. How did you know what the next square numbers would be?
3. Complete the table below by filling in the square numbers.

<table>
<thead>
<tr>
<th>Term</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>14</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Write down the rule you would apply to determine what any given square number would be.
5. Use this rule to determine:
   a. The 30th number
   b. The 50th square number
6. a. The square number is 256. What is the term?
   b. The square number is 1296. What is the term?

**EXERCISE 5**

**FIBONACCI SEQUENCE**

Leonardo Fibonacci was an Italian mathematician who gave his name to a special number sequence. This sequence occurs in nature. For instance, the seeds in a sunflower head are arranged in a Fibonacci sequence, as are the seed spirals in a pine cone.

Study the numbers below:

0; 1; 1; 2; 3; 5; 8; 13; …

1. What pattern is used to determine the numbers in the sequence?
2. Complete the table with Fibonacci numbers:
EXERCISE 6

PASCAL’S TRIANGLE

This refers to a special number pattern arranged in a triangle that was discovered by the mathematician Blaise Pascal.

Look at Pascal’s triangle below:

```
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
```

1. How does Pascal’s triangle work?
2. Complete up to row 10 of the triangle.
3. Use Pascal’s triangle to complete the table below:

<table>
<thead>
<tr>
<th>Row Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum of Numbers In a row</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FUNCTIONS AND RELATIONSHIPS

Use formulae to determine inputs and outputs. Using a formula is often the quickest way of calculating the area of a shape. Formulae are number sentences containing symbols that are used for mathematical calculations.

Example:
The area of a rectangle is \( A = l \times b \) where \( A \) represents the area, \( l \) represents the length and \( b \) represents the breadth.

Now let’s see how to calculate the following:

a) The area if \( l = 7 \text{ m} \) and \( b = 4 \text{ m} \).
b) The area if \( l = 9,5 \text{ cm} \) and \( b = 4 \text{ cm} \).
c) The \( l \) if the area is 44 \( \text{ m}^2 \) and the \( b = 11 \text{ m} \).

Answers:

a) \( A = l \times b \) \( A = 7 \text{ m} \times 4 \text{ m} \) \( A = 28 \text{ m}^2 \)
b) \( A = l \times b \) \( A = 9,5 \text{ cm} \times 4 \text{ cm} \) \( A = 38 \text{ m}^2 \)
c) \( A = l \times b \) \( A = \frac{a}{b} = \frac{44}{11} \) \( l = 4 \text{ m} \)

EXERCISE 7: COMPLETING FORMULAS

1. The following formula is given: \( y = 5x + 9 \). Determine the value of:

a) \( y \) if \( x \) is 7
b) \( y \) if \( x \) is 47
c) \( y \) if \( x \) is 0,8
d) \( y \) if \( x \) is 3,17
e) \( y \) if \( x \) is \( \frac{3}{5} \)
2. The following formula is given: \( y = 3x + 8 \). Determine the value of:
   a) \( x \) if \( y = 14 \)
   b) \( x \) if \( y = 9 \)
   c) \( x \) if \( y = 34 \)
   d) \( x \) if \( y = 19 \)
   e) \( x \) if \( y = 0 \)

**EXERCISE 8: COMPLETING FLOW DIAGRAMS**

A flow diagram makes use of the following process:

Input number → Operation and number → Output number

Example: 56 → \( \frac{\_}{8} \) → 7

72 → \( \frac{\_}{8} \) → 9

i.e. Input number (56) divided by 8 gives the output number (7)
i.e. Input number (72) divided by 8 gives the output number (8)

1. Complete the following diagrams:

   10 → ● → a
   23 → ● → b
   35 → ● → c
   D → ● → 441
8 → x20 → -15 → e
14 → f
15 → g
50 → h
l → 1985

7 → x15 → +15 → i
k → 195
21 → l
m → 540
n → 765

5 → P → 65
12 → 156
18 → 234
20 → 260

9 → +3,5 → q → 33,75
35 → 96,25
75 → 196,25
125 → 321,25
EXERCISE 9: COMPILING FLOW DIAGRAMS

Compile and complete flow diagrams to match the following problems.

1. Carmen’s job is to sew buttonholes. If there are 9 buttonholes per shirt, how many buttonholes will she sew if she is given 5, 10, 15, 20 shirts?
2. Tumi works for a clothing company and gets paid R25 for every collar she makes. To determine her wages for the day, she has to deduct R15 for expenses from wages for that day. How much does she earn if she makes 15, 24, 50, 65 collars?
3. Randal is able to make a sleeve with a cuff in 12 minutes. At the end of each day, he has to add 15 minutes to the total time he worked for that day for administration. How many minutes did he take throughout the day to make 7, 18, 45, 68 sleeves?
4. Paddy is a taxi driver. He charges 90c per kilometre, plus a fixed amount of R4,75. How much will the travelling cost for a distance of 12, 15, 60, 75 kilometres?
5. To cook a roast, the meat must be left in a hot oven for 30 minutes for every kilogram of meat that there is, plus an additional 15 minutes to brown it properly. How long will it take to roast if the meat weighs 2kg, 5kg, 7,5kg, 9kg?

TABLE REPRESENTATIONS OF PATTERNS

Tables help us to detect or represent certain patterns in an easy way.

Study the blocks below:

1. 

2. 


How would you draw the third and fourth figures? Use the following table to help you.

<table>
<thead>
<tr>
<th>Figure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of blocks</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What pattern do you notice? Did you see how easy it was to spot the pattern when the numbers are written in table form?

**REMEMBER**

It is important to discover the rule of the number pattern. Once you’ve discovered the rule, it is easy to make a calculation.

**EXERCISE 10**

1. Let’s build squares with matches:

<table>
<thead>
<tr>
<th>Square</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. matches</td>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

a. How many matches are needed to build one square?
b. How many are needed to build two squares?
c. How many matches are needed to build three squares?
d. What is the pattern that the matches form? The following table will help you to determine the pattern more easily: Draw the table in your book and complete:

<table>
<thead>
<tr>
<th>Squares</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matches</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
e. How many squares can you build with 34 matches?
f. How many matches do you need to build 100 squares?

EXERCISE 11

Build a pentagon

<table>
<thead>
<tr>
<th>Pentagon</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawing</td>
<td>□</td>
<td>□□</td>
<td>□□□</td>
</tr>
<tr>
<td>Matches</td>
<td>5</td>
<td>9</td>
<td>13</td>
</tr>
</tbody>
</table>

a. How many matches do you need to build four pentagons?
b. Write down the first ten terms of this series of numbers in a table.
c. What is the rule that you would apply to work out how many matches were used if you built 25 pentagons?

USING TABLES

The letter ‘n’ is used to indicate a certain term. We call this the ‘nth’ term.

Example:
‘n + 5’. This means a certain number plus 5.
The value of that number (i.e. n) is given in the first row.
The table would thus look like this:

<table>
<thead>
<tr>
<th>n</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>n + 5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>15</td>
<td>25</td>
<td>55</td>
<td>505</td>
</tr>
</tbody>
</table>
EXERCISE 12

Copy the following tables into your book and complete them.

1. 

<table>
<thead>
<tr>
<th>n</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>225</th>
<th>500</th>
<th>750</th>
<th>902</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>n - 51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. 

<table>
<thead>
<tr>
<th>n</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>27</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>12n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. 

<table>
<thead>
<tr>
<th>n</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>20</th>
<th>50</th>
<th>100</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>6n + 112</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. 

<table>
<thead>
<tr>
<th>n</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
<th>30</th>
<th>60</th>
<th>0</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>7n - 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. 

<table>
<thead>
<tr>
<th>n</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>85</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>13n - 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ALGEBRAIC EXPRESSIONS

Mathematics is a language. To be successful at Mathematics and at any language, you need to learn new words and understand what the words mean. Mathematical language is used in algebraic expressions. The four basic
operations are addition, subtraction, multiplication and division. Each operation has a symbol.

A symbol is a thing that stands for something else, for example + is the symbol for add.

Example: Write these word problems in mathematical language:

a) The sum of 12 and 45
b) 14 increased by 20
c) The difference between 62 and 48
d) 83 decreased by 22
e) The product of 29 and 13

Answers:

a) 12 + 45 = 57 The sum
b) 14 + 20 = 34 The sum
c) 62 – 48 = 14 The difference
d) 83 – 22 = 61 The difference
e) 29 x 13 = 377 The product

In Algebra we use letters to represent numbers to help us solve problems. We call the letters ‘variables’ because they can stand for any unknown number. For example, if you know that a number will be 3 times bigger, you can use a letter for the unknown value to make an expression: 3 \times y.

In an expression, the number on its own without any variable is the constant. In the expression 5p + 3, the number 3 is the constant.

The number in front of the variable is called the coefficient. In this case, 5 is the coefficient of p. The coefficient is a number by which to multiply a variable.
WHAT ARE EQUATIONS?

• In an equation, we use letters to represent the value of a number. These letters are called variables.

  Example: Instead of saying
  \[ \square + 7 = 12, \text{ we say} \]
  \[ x + 7 = 12 \]

  *(Thus, letters of the alphabet are used to represent unknown quantities/numbers)*

• There are input and output variables.

  Input variable: \[ y + 3 = 9 \]
  Output variable: \[ 27 - 14 = z \]

*Number statements that contain variables are called *equations*.*

**EXERCISE 13**

Write down the equation only for each of the following problems:

a. 16 more than a certain number is 45. What is the number?

b. Dineo is given R 25 by her aunt. Her grandfather then gives her 5 times that amount. How much money does she have?

c. Cassie is given her pocket money at the start of the month. After spending R 12 on sweets, she has R 78 left. How much pocket money does she get?

d. Six more than 8 times a number is 70. What is the number?

e. Half of 10 times a number is 50. What is the number?
EXERCISE 14

DIFFERENTIATED ASSIGNMENT: LEVEL 1 (INFORMAL)

Write number sentences for each of the problems below:

a. Danny thinks of a number. He multiplies it by 6 and subtracts 4 to get an answer of 26. What is the number?
b. 25 increased by a number gives 60. What is the number?
c. Rose is 8 times older than her son. If Rose is 40, how old is her son?
d. I received R125 from my friend for my birthday. My parents also give me money as part of my gift. If I have R550 altogether, how much did my parents give me?
e. Seventeen pet owners each pay R235,50 for their animals to stay at a pet care centre while they are away. If it cost the pet care centre R180,25 to care for each animal, what is the total profit it has made?
f. Eleven times a number, decreased by 12, gives 120. What is the number?
g. A quarter of 12 times a number equals 36. What is the number?
h. 150 Grade 6 learners each contribute R20 towards the Grade 7 Farewell. If the food costs R2 500 then how much money is left for the remaining expenses?
i. Five more than 8 times a number is 53. What is the number?
j. If Jabu buys 12 chocolates at R4,50 per chocolate and 9 suckers at R2,25 per sucker, how much change will he get if he pays with R150?

DIFFERENTIATED ASSIGNMENT: LEVEL 2 (INFORMAL)

Write number sentences for each of the problems below:

a. If I spend R367 and I have R198 left, how much money did I have?
b. Half of 8 times a number gives 28. What is the number?
c. Thirty-one children each pay an amount of R55 for a school trip. How much money was paid altogether?
d. Fifteen times a number, decreased by 10, gives 80. What is the number?
e. A tour guide charges R150 per person, plus an additional administrative fee of R275. If 17 people go on the tour, how much money is he paid?
f. If you buy 11 suckers at R1,25 per sucker and 7 cooldrinks at R5,50 per cooldrink, and you pay with a R100 note, how much change will you receive?
g. If Sasha grows another 25 cm, she will be 1,57 m tall. How tall is she now?
h. Riaad shares 96 sweets amongst 16 boys and 75 suckers amongst 15 girls in his class, how many does he have left?
i. A certain number, decreased by 12, is divided by 8. If the answer is 9, what is the number?
j. There are 32 learners in each of the 5 Grade 7 classes. If an additional 3 learners join the group at the start of the new term, how many Grade 7 learners are there?

DIFFERENTIATED ASSIGNMENT: LEVEL 3 (INFORMAL)

Write number sentences for each of the problems below:

a. My age, decreased by 9, gives 16. How old am I?
b. If Tracey gains another 800g, she will weigh 52,6 kg. How much does she currently weigh?
c. Half of a certain number is 60 less than 120. What is the number?
d. Forty more than a certain number, multiplied by 4, is equal to 200. What is the number?
e. 24 more than a number, increased by a third of the number, equals 68. What is the number?
f. Our school has 1155 learners. If each class has 33 learners, how many classes are there?
g. Terry brings 6 sweets per child in her class to celebrate her birthday, but brings an extra 5 sweets for her 5 friends who are not in her class. How many sweets does she bring in total?
h. Michael makes 14 muffins from one mixture. How many mixtures are needed to make 238 muffins?
i. If you buy 25 sweets at R2,15 per sweet and 13 packets of crisps at R4,20 per packet, and you pay with R150, how much change will you receive?
j. A certain number multiplied by 10 and divided by 5, gives 60. What is the number?
**EXERCISE 15**

**SOLVING EQUATIONS BY INSPECTION.**

Give solutions to the equations below:

1. \(10 + a = 24\)  
2. \(b - 91 = 110\)  
3. \(7c = 56\)  
4. \(\frac{100}{d} = 50\)  
5. \(e + e = 100\)  
6. \(250 - f = 197\)  
7. \(12g = 132\)  
8. \(\frac{h}{3} = 18\)  
9. \(i + 179 = 247\)  
10. \(463 - j = 129\)

11. \(9k = 117\)  
12. \(\frac{400}{25} = l\)  
13. \(10m = 70\)  
14. \(169 - n = 25\)  
15. \(p + 213 = 509\)  
16. \(\frac{a}{12} = 13\)  
17. \(640 - 138 = r\)  
18. \(8s = 88\)  
19. \(1010 + 2769 = t\)  
20. \(\frac{121}{u} = 11\)

**DEVELOPING METHODS TO SOLVE EQUATIONS**

Study the method of solving the equation below:

**Example 1**

\[4x - 3 = 13\]

\[4x - 3 + 3 = 13 + 3\] (add 3 to each side)  
\[4x = 16\]

\[x = 16 + 4\] (divide 16 by 4 to get the value of x)  
\[x = 4\]
Example 2

\[ 12a + 5 = 65 \]
\[ 12a + 5 - 5 = 65 - 5 \] subtract 5 from each side
\[ 12a = 60 \] divide 60 by 12 to get the value of a
\[ a = \frac{60}{12} \]
\[ a = 5 \]

Example 3

\[ \frac{y}{5} + 4 = 10 \]
\[ \frac{y}{5} + 4 - 4 = 10 - 4 \] subtract 4 from each side
\[ \frac{y}{5} = 6 \]
\[ y = 6 \times 5 \] multiply 6 by 5 to get value of y
\[ y = 30 \]

- To solve these equations, we use the inverse operations.
  - The additive inverse of 10 is –10
  - The additive inverse of 5 is –5

**EXERCISE 16**

1. \[ 5a + 3 = 38 \]
2. \[ 9b + 8 = 80 \]
3. \[ 11c + 12 = 111 \]
4. \[ 2d - 2 = 26 \]
5. \[ 4e - 3 = 25 \]
6. \[ 6f - 2 = 40 \]
7. \[ \frac{50}{g} + 3 = 5 \]
8. \[ \frac{h}{2} + 5 = 12 \]
9. \[ \frac{60}{l} - 10 = 20 \]
10. \[ j - 4 = 6 \]
11. \[ \frac{5k}{2} = 15 \]
12. \[ \frac{3l}{4} + 2 = 8 \]
EXERCISE 17

SOLVE THE FOLLOWING EQUATIONS

1. \(3\ 156 - a = 2\ 175\)
2. \(12\ b + 3 = 51\)
3. \(5\ c - 4 = 31\)
4. \(7\ d + 5 = 68\)
5. \(\frac{e}{3} = 11\)
6. \(\frac{f}{4} - 1 = 5\)
7. \(\frac{75}{g} + 5 = 20\)
8. \(2\ h + 9 = 99\)
9. \(50\ i - 12 = 88\)
10. \(\frac{2\ l}{4} - 6 = 9\)
11. \(8\ k - 3 = 69\)
12. \(\frac{4\ l}{5} = 8\)
13. \(9\ m + 2 = 56\)
14. \(3\ n + 4 = 25\)
It is often useful to represent data on a graph as they are visual representations of data. In previous grades you were introduced to bar graphs and pictographs and pie charts.

Examples:

Pie charts are useful to represent data if you want to compare parts of a whole.

Bar graphs are useful to represent data if we want to compare properties of different groups.
We will focus on line graphs which represent the relationship between two variables graphically.

**Facts I got Correct**

As you can see, we can represent different types of information or data on a line graph. Daily temperatures, Maths scores, Number of people in a store and Facts you got correct. It is easier to show data on a line graph.

It is clear from line graphs that we use dependent variables and independent variables. Dependent variable is the quantity being observed and independent variable is the quantity being manipulated.
To transform means to change, so transformation of a 2D shape is a change made to the shape. We can transform a shape in different ways: by moving it, reflecting it or turning it. All the transformations that we deal with are rigid transformations. This means that the size and the shape of the 2D shape remain unchanged. We call the original shape the object and the transformation is called the images.

The first one we look at is: Translation- A translation moves an object from one place to another. Every point in a 2D shape is moved by a fixed distance in a given direction. The shape can be moved up or down and left and right.

The letter E has been moved to the right: \[ E \rightarrow E \]

The letter S has been moved down: \[ S \]

The star has been translated right and down.

The star has been translated right and down.
The green shape below is the image of the original shape after a translation. A translation is also sometimes referred to as a slide. You slide an object to get its image.

The second transformation that we look at is reflection. A reflection of a 2D shape is a mirror image of the shape. This transformation ‘flips’ a figure over a mirror line called the line of symmetry. A line of symmetry divides a figure into two mirror-image halves and is usually drawn as a dotted line.

Many plants and animals and other living things in nature are symmetrical.
The third transformation that we look at is rotation. In a rotation, a 2D shape is turned around a point that is called the point of rotation. We describe a rotation as being clockwise or anticlockwise around the point of rotation. The hands on a clock face move to the right, rotating around the centre of a clock face. We call this movement a clockwise rotation.

The number of positions a shape can be rotated to without making any changes to the way it looked originally is called the order of rotational symmetry. Every 2D shape has rotational symmetry of at least order 1. If the order of rotational symmetry of a 2D shape is 1, we do not regard this shape as having true rotational symmetry.

An equilateral triangle (with all sides equal) has order of rotational symmetry of three (3).
EXERCISE 18
Copy and complete the following table in your book.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Shape of faces</th>
<th>Name of Geometric solid</th>
<th>No. of faces</th>
<th>No. of edges</th>
<th>Sum of faces and vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Apex</td>
<td>Base</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
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<tr>
<td>7.</td>
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<tr>
<td>8.</td>
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</tr>
<tr>
<td>9.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
## SIMILARITIES AND DIFFERENCES BETWEEN DIFFERENT GEOMETRIC SOLIDS

**EXERCISE 19**
Copy the table below and complete it.

<table>
<thead>
<tr>
<th>Solid</th>
<th>Similarities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone</td>
<td>Tetrahedron</td>
<td></td>
</tr>
<tr>
<td>Pyramid</td>
<td>Triangular Prism</td>
<td></td>
</tr>
<tr>
<td>Cylinder</td>
<td>Cone</td>
<td></td>
</tr>
<tr>
<td>Tetrahedron</td>
<td>Pyramid</td>
<td></td>
</tr>
<tr>
<td>Octagonal Prism</td>
<td>Hexagonal Prism</td>
<td></td>
</tr>
</tbody>
</table>
**EXERCISE 20**
Copy and complete the table below. (You may need to cut out models to check that the nets are accurate).

<table>
<thead>
<tr>
<th>Name of 3D Shape</th>
<th>Diagram</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pyramid</td>
<td><img src="image1" alt="Pyramid Diagram" /></td>
<td></td>
</tr>
<tr>
<td>2. Hexagonal Prism</td>
<td><img src="image2" alt="Hexagonal Prism Diagram" /></td>
<td></td>
</tr>
<tr>
<td>3. Tetrahedron</td>
<td><img src="image3" alt="Tetrahedron Diagram" /></td>
<td></td>
</tr>
<tr>
<td>4. Cone</td>
<td><img src="image4" alt="Cone Diagram" /></td>
<td></td>
</tr>
<tr>
<td>5. Pentagonal Pyramid</td>
<td><img src="image5" alt="Pentagonal Pyramid Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>