SMILE Tutor

EFFICIENT . EFFECTIVE . EASY

PSLE Maths Revision Notes

2015 PSLE Mathematics
Revision/Summary Notes

Topics

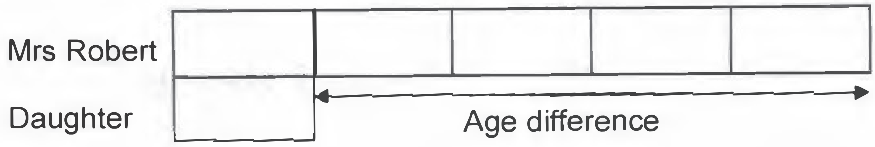
Topic: Whole Numbers

Key Concept: **Constant difference**

Example:

Mrs Robert is 36 years old and her daughter is 24 years younger.
How many years ago was Mrs Robert five times as old as her daughter?

Method 1:



Difference in age → 36 – 12 = 24 (age difference remains unchanged)

4 units → 24
1 unit → 6

Mrs Robert's age when her daughter was 6 years old → 6 × 5 = 30
Number of years ago → 36 – 30 = 6 years ago

Method 2:

	Mrs Robert	:	Daughter	:	Difference
	36	:	12	:	24
Now	3	:	1	:	2
Before	5	:	1	:	4
	5 × 6	:	1 × 6	:	4 × 6
	30	:	6	:	24

Number of years ago → 36 – 30 = 6 years ago

Ans: 6

Topic: Whole Numbers   Key Concept: **Proportion / Grouping**

Example:

For a school charity sale, every girl was given 5 tickets to sell and every boy was given tickets to sell. There were thrice as many girls as boys at the sale. Given that a total 576 tickets were sold, how many girls were at the charity sale?

	Number of pupils (units)	Number of tickets		Total number
Girls	3 units	5	→	15 units
Boys	1 unit	3	→	3 units

Total number of units → 15 + 3 = 18 units

18 units → 576
1 unit → 32
3 units → 32 × 3
= 96

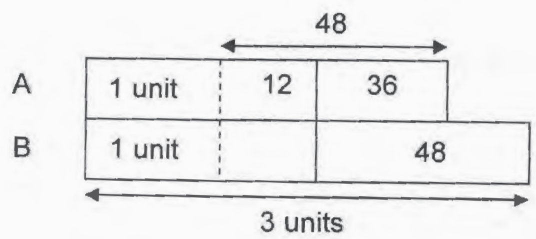
Number of girls at the charity sale = 96

Ans: 96

Key Concept: **More than/Less than with internal transfer**

Example:

The number of marbles in container A was 36 more than that in container B.
When 48 marbles were removed from container A and placed in container B, the number of marbles in container B became thrice that of container A.
Find the number of marbles in container A at first.



2 units → 12 + 48 = 60
1 unit → 30
Number of marbles in container A at first → 30 + 12 + 36 = 78

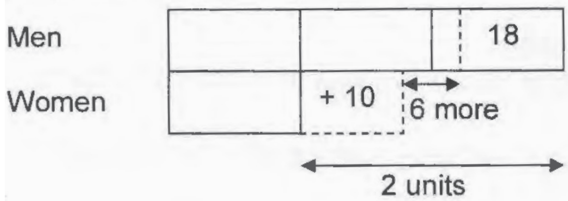
Ans: 78

Topic: <u>Whole Numbers</u> Key Concept: **<u>More than/Less than</u>**

<u>Example:</u>

There were three times as many men as women at the party at first. After 18 men left and 10 women entered the party, there were 6 more men than women remaining at the party. Find the number of men at the party at first.

<u>Method 1:</u>



2 units → 10 + 6 + 18 = 34
1 unit → 17
3 units → 17 × 3 = <u>51</u>

<u>Method 2:</u>

Men	:	Women
3u	:	1u
- 18	:	+ 10

3u – 18 – (1u + 10) = 6
2u = 6 + 18 + 10 = 34
1u = 17
3u = <u>51</u>

Ans: <u>51</u>

Algebra

Simple Algebraic Expressions

$n+2$, $6-m$, $3p$, $\frac{6}{q}$, $\frac{y+3}{4}$

★ no ÷ or × can be in ans ★

Interpreting Algebraic Notations

- $3y = y+y+y$ or $3 \times y$
- $\frac{y}{2} = y \div 2$ or $\frac{1}{2} \times y$
- $\frac{3-y}{5}$ as $(3-y) \div 5$ or $\frac{1}{5} \times (3-y)$

Simplification of algebraic expressions

To "simplify" means to "write as simply as possible".

Example 1:

Simplify $6a + 4a \boxed{-8} - 2a \boxed{+9}$

$$6a + 4a - 8 - 2a + 9 = \underbrace{6a + 4a - 2a}_{8a} + \underbrace{-8 + 9}_{1}$$

$$= 8a + 1$$

Example 2:

A square has sides of length $(3b+2)$ cm. What is its perimeter?

Perimeter of square

$= (3b+2) + (3b+2) + (3b+2) + (3b+2)$

$= 3b + 3b + 3b + 3b + 2 + 2 + 2 + 2$

$= (12b + 8)$ cm

OR

Perimeter of square $= 4(3b+2) = (12b+8)$ cm

Evaluating algebraic expressions

Replace the unknown with the given value and then simplify.

Example 1:

Evaluate $4y - 11$ when $y = 8$.

When $y = 8$, $4y - 11 = 4 \times 8 - 11$

$= 21$

Example 2:

Evaluate $\frac{3}{2}p + 7 - p$ when $p = 8$.

When $p = 8$, $\frac{3}{2}p + 7 - p = \frac{3}{2} \times 8 + 7 - 8$

$= 11$

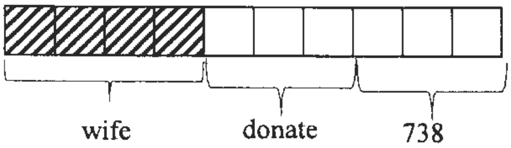
Topic: <u>Fraction</u> Key Concept 1: <u>Remainder</u>

<u>Example:</u>

Mr Toh gave $\frac{2}{5}$ of his money to his wife and donated $\frac{1}{2}$ of the remainder to charity.

If he had \$738 left, how much did he give his wife?

Mtd 1: Draw model



3 units → 738

1 unit → 738 ÷ 3

= 246

4 units → 246 x 4

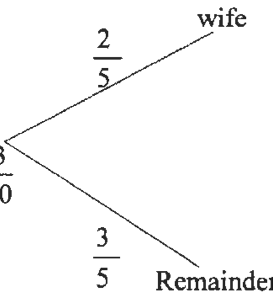
= 984

Mtd 2 : Branching

Remainder → $\frac{3}{5}$

Left → $\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$

Wife → $\frac{2}{5} = \frac{4}{10}$



$\frac{3}{10}$ → 738

$\frac{1}{10}$ → 738 ÷ 3

= 246

$\frac{4}{10}$ → 246 x 4

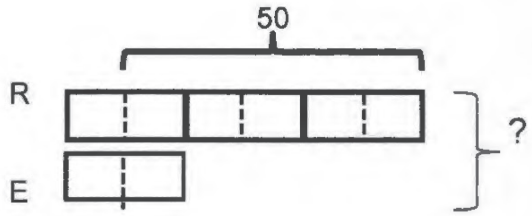
= 984

Ans: <u>\$984</u>

Topic: Fraction Key Concept 2: One item constant

Example:

Renee baked thrice as many muffins as Emma. Renee sold 50 of her muffins. Then, she had $\frac{1}{2}$ as many muffins as Emma. How many muffins did both girls bake?



5 units → 50

1 unit → 50÷5
→ 10

8 units → 10 x 8
→ 80

Ans: 80

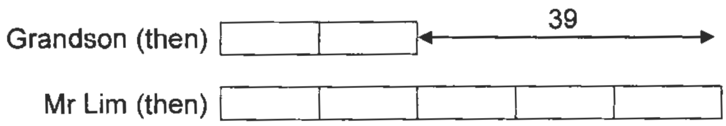
Topic: <u>Fraction</u> Key Concept 3: <u>Constant Difference</u>

<u>Example:</u>

Mr Lim is 50 years old and his grandson is 11 years old.
How many years later will Mr Lim's grandson be $\frac{2}{5}$ as old as Mr Lim?

Age difference $\rightarrow 50 - 11 = 39$

> ***<u>Note:</u>***
> ***Age difference between 2 people is a constant. The difference remains the same throughout.***



$3u \rightarrow 39$
$1u \rightarrow 39 \div 3 = 13$
Grandson then (2u) $\rightarrow 2 \times 13 = 26$
No. of years later $\rightarrow 26 - 11 =$ <u>**15**</u>

Ans: <u>15</u>

Topic: <u>Fraction</u> Key Concept 4: <u>Total constant</u>

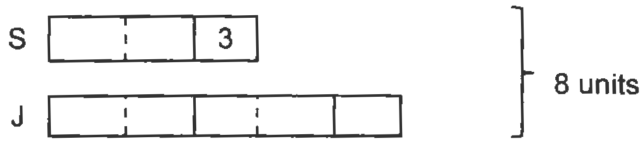
<u>Example:</u>

Siti had $\frac{1}{3}$ the number of stickers Jean had at first. After Jean gave 3 of her stickers to Siti, Siti had $\frac{3}{5}$ the number of stickers Jean had. How many stickers did Jean have at first?

When we convert $\frac{1}{3}$ to $\frac{2}{6}$, we get 8 units. Notice that the second fraction, $\frac{3}{5}$, also consist of 8 units.

The total units remains the same.

After transfer of 3 stickers from Jean to Siti, the **total units remain constant** although the fraction of Siti's stickers compared to Jean's changes to $\frac{3}{5}$



1 unit → 3

6 x 3 = **<u>18</u>**

Jean had 18 stickers at first.

Topic: <u>Percentage</u>   Key Concept: **<u>One item constant</u>**

<u>Example:</u>

Susan has 25% more stickers than Amanda. Mary has 25% fewer stickers than Amanda. Susan has 200 more stickers than Mary. How many stickers does Susan and Amanda have altogether?

Susan : Amanda

125 : 100

5 : 4

Mary : Amanda

75 : 100

3 : 4

- **Amanda is constant**

Susan : Amanda : Mary

5 : 4 : 3

5 – 3 = 2

2u --- 200
u --- 100
9u --- 900

Ans: **<u>900</u>**

Topic: Percentage Key Concept: **Constant Total**

Example:

Cathy bought a novel. The number of pages of novel she ~~has~~ had read ~~in~~ last week ~~is~~ was 20%. If she read another 240 pages, the number of pages she ~~has~~ had not read ~~will~~ would become 20%. How many pages did her novel have?

Using ratio method:

At first

Read : Unread : Total
20 : 80 : 100
1 : 4 : 5

If she reads another 240 pages

-3u

80 : 20 : 100
4 : 1 : 5

Observe the change for READ pages is from 20% to 80% (1unit to 4 units)

Difference in unit → 4-1 = 3
3 units → 240
Total (5units) → 240 ÷ 3 x 5 = 400

Ans: **400**

Topic: Percentage Key Concept: **Constant Difference**

Example:

There was a jar of blue and green buttons. 60% of the buttons were blue and the rest were green. After adding another 140 blue and 140 green buttons, the ratio of the blue buttons to green buttons became 7 : 5. How many buttons were there in the jar in the end?

Before

Blue : Green : Difference

6 : 4 : 2

After

Blue : Green : Difference

7 : 5 : 2

1 units → 140

12 units → 12 x 140 = 1680

Ans: **1680**

Topic: <u>Percentage</u>   Key Concept 1: <u>More than/Less than</u>

Example:

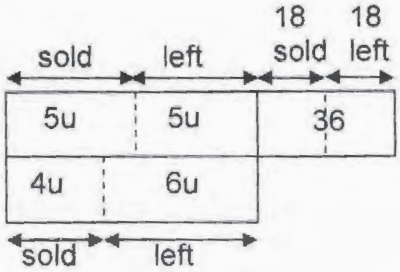
Mrs Lim had 36 more roses than tulips. After she had sold 50% of the roses and 40% of the tulips, she was left with 3 more tulips than roses. How many tulips did she have at first?

Method 1:

Before

Roses

Tulips



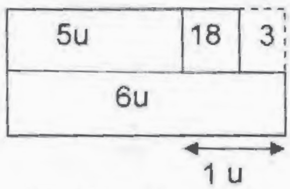
Note: $50\% = \frac{1}{2} = \frac{5}{10}$

$40\% = \frac{2}{5} = \frac{4}{10}$

After

Roses

Tulips



1 unit → 18 + 3 = 21

10 units → 21 × 10 = <u>210</u>

Method 2:

	Roses	:	Tulips
	10u + 36	:	10u
Sold	5u + 18	:	4u
Left	5u + 18	:	6u

6u – (5u + 18) = 3

1u = 21

10u = <u>210</u>

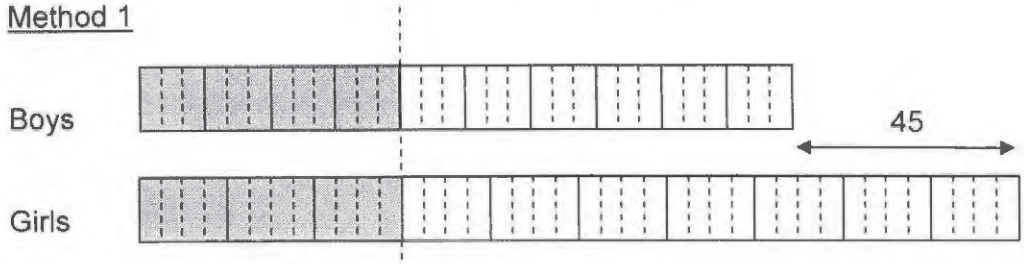
Ans: <u>210</u>

Topic: <u>Percentage</u> Key Concept 2: <u>Equal</u>

<u>Example:</u>

At a funfair, 40% of the boys is equal to 30% of the girls. If there are 45 more girls than boys, what is the total number of children at the funfair?

<u>Method 1</u>



Difference in units → 10 units

10 units → 45
70 unit → <u>315</u>

<u>Method 2</u>

$\frac{2}{5}$ boys → $\frac{3}{10}$ girls

$\frac{6}{15}$ boys → $\frac{6}{20}$ girls

Total boys → 15 units

Total girls → 20 units

Difference in units → 5 units

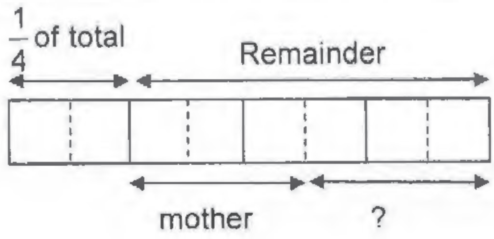
5 units → 45
35 unit → <u>315</u>

Ans: <u>315</u>

Topic: Percentage Key Concept 3: Part-whole relationship

Example:

June spent 25% of her salary on a computer. She gave 50% of the remaining money to her mother.
(a) What fraction of her money was left?
(b) If she was left with $750, how much did June have at first?



(a) Fraction of her money left → $\frac{3}{8}$

(b)

3 units → $750
1 unit → $250
8 units → $2000

Ans: $2000

Topic: <u>Percentage</u> Key Concept 4: <u>Repeated Identity</u>

Example:

There are 50% as many boys as girls and 20% more adults than children at a graduation party. Given that there are 24 more adults than girls, how many people were there at the party altogether?

	Boys	:	Girls	:	Adults	
	50%	:	100%			
× 5	1	:	2			
	100%			:	120%	
× 3	5			:	6	× 3
	5	**:**	**10**	**:**	**18**	

Difference in units each → 18 units − 10 units = 8 units

8 units → 24
1 unit → 3
33 units → 33 × 3 = <u>93</u>

Ans: <u>93</u>

Constant total

Topic: Percentage   Key Concept 5: ~~Internal (Unchanged total quantity)~~

Example:

Maggie had 50% fewer pencils than Joan. After Joan gave 7 of her pencils to Maggie, Maggie had 40% fewer pencils than Joan. How many pencils did Maggie have at first?

	Maggie	:	Joan
Before	50%	:	100%
	1 × 8	:	2 × 8
	8	:	**16**
After	60%	:	100%
	3 × 3	:	5 × 3
	9	:	**15**

Note: The total number of units remains unchanged.

Transfer in units → 1 unit

1unit → 7
8 units → 8 × 7 = 56

Ans: 56

Topic: Percentage Key Concept 6: Constant Difference

Example:

At a charity fair, there are 60% as many boys as girls. ~~60% of them were boys.~~ After 45 boys and 45 girls left the fair, there were 30% as many boys as girls. How many boys were there at the fair at first?

	Boys	:	Girls
Before	60%	:	100%
	3 × 7	:	5 × 7
	21	:	**35**
After	30%	:	100%
	3 × 2	:	10 × 2
	6	:	**20**

> Note: Difference between the boys and girls must remain the same.

Difference in units each → 21 units – 6 units = 15 units

15 units → 45
1 unit → 3
21 units → 21 × 3 = 63

Ans: 63

Topic: Percentage
Key Concept 7: External (Unchanged total quantity)

Example:

At a farm, 40% of the animals were sheep while the rest were horses. After 20 sheep have been sold, the percentage of sheep dropped to 30%. How many horses were there?

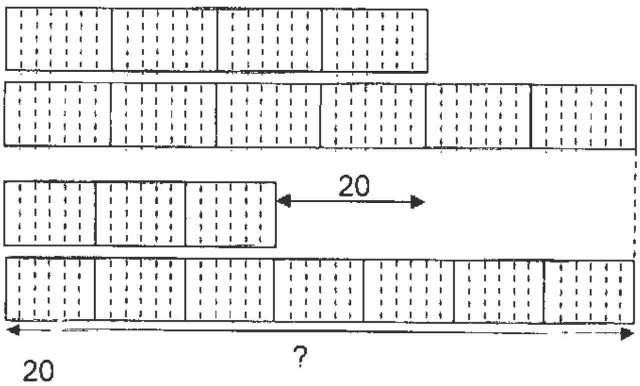
Method 1:
Before

Sheep

Horses

After
Sheep

Horses



Note: The number of horses remained unchanged.

10 units → 20

42 units → $\frac{42}{10} \times 20 = \underline{82}$

Method 2:

	Sheep		:	Horses	
Before	4		:	6	
	28	× 7	:	42	× 7
After	3		:	7	
	18	× 6	:	42	× 6

Difference in units → 28 - 18 units = 10 units
10 units → 20

42 units → $\frac{42}{10} \times 20 = \underline{82}$

Ans: 82

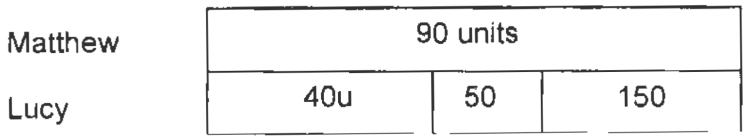
Topic: <u>Percentage</u> Key Concept 8: ~~External changed~~ units and parts

<u>Example:</u>

Matthew had 45% as many stickers as Lucy at first. Matthew gave away 15 stickers and Lucy bought 25 stickers. Now Matthew had 20% as many stickers as Lucy. How many stickers did Lucy have at first?

		Matthew	:	Lucy	
Before		45%	:	100%	
	× 10	9 units	:	20 units	× 2
Change		- 15	:	+ 25	
After		2 parts	:	10 parts	

Note: The final total number of parts must be equal.



50 units → 200
1 unit → 4
20 units → 4 × 20 = <u>80</u>

Ans: <u>80</u>

Percentage [INTERPRETING STATEMENTS]

. Amy has 40% **times** ***as many*** books $\boxed{\text{as}}$ Ben.

First, convert the percentage to fractions. $40\% = \frac{40}{100} = \frac{2}{5}$

That means:

Amy has $\frac{2}{5}$ **times as many** books as ***Ben***.

Amy → 2 units
Ben → 5 units

---

2. Amy has 140% ***as many*** books $\boxed{\text{as}}$ Ben.

First, convert the percentage **to** improper fraction. $140\% = 1\frac{40}{100} = 1\frac{2}{5} = \frac{7}{5}$

That means:

Amy has $\frac{7}{5}$ **as many** books as ***Ben***.

Amy → 7 units
Ben → 5 units

Percentage [INTERPRETING STATEMENTS]

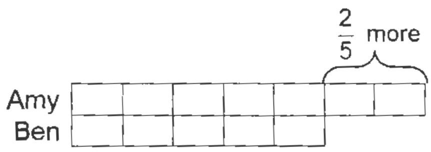
Amy has 40% ***more*** books than Ben.

First, convert the percentage to fractions. $40\% = \frac{40}{100} = \frac{2}{5}$

That means:

Amy has $\frac{2}{5}$ **more** books as ***Ben***. (or Amy has 2 units more than Ben)

Amy → (5 + 2) units = 7 units
Ben → 5 units



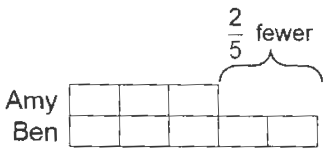
Amy has 40% ***fewer*** books than Ben.

First, convert the percentage to fractions. $40\% = \frac{40}{100} = \frac{2}{5}$

That means:

Amy has $\frac{2}{5}$ **fewer** books as ***Ben***. (or Amy has 2 units fewer than Ben)

Amy → (5 - 2) unit = 3 units
Ben → 5 units



Amy ***gave away*** 40% of her books.

First, convert the percentage to fractions. $40\% = \frac{40}{100} = \frac{2}{5}$

That means:

Amy ***gave away*** $\frac{2}{5}$ of her books.

Total → 5 units
Gave → 2 units
Left → (5 – 2) = 3 units

Summary Chart

Percentages

Expressing a part of a whole as a percentage
Example: Express 85 out of 100 as a percentage.

85 out of 100 = $\frac{85}{100}$

$\frac{85}{100} \times 100\% = 85\%$

Finding a percentage part of a whole
Example: What is 70% of \$350?

70% of \$350 = $\frac{70}{100} \times \$350 = \$245$

Expressing fractions and decimals as percentages, and vice versa

Fraction	Decimal	Percentage
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{8}$	0.125	12.5%

Finding the whole given a part and the percentage
Example: 35% of the pupils in a class are boys. If there are 28 boys in the class, how many pupils are there in the class?
35% → 28 boys

100% → $\frac{28}{35} \times 100 = 80$

Hence there are 80 pupils in the class.

Finding percentage decrease
Example: Shirley weighed 48 kg last year. She weighs 42 kg now. What is the percentage decrease in her mass?

Decrease in her mass = (48 – 42) kg = 6 kg

% decrease in her mass = $\frac{6}{48} \times 100\%$

= 12.5%

Finding percentage increase
Example: Hazel was 150 cm last year. Her height increased to 153 cm this year. Find the percentage increase in her height.

Increase in height = (153 – 150) cm = 3 cm

% increase in height = $\frac{3}{150} \times 100\% = 2\%$

Discount
Exmaple: A toy costs \$48. It is sold at a discount of 20%. Find the selling price of the toy after discount.

100% – 20% = 80%

$\frac{80}{100} \times \$48 = \$38.40$

The selling price after discount is \$38.40.

GST
Example: The price of a bag was \$25 before 7% GST. Find the price of the bag after GST.
100% → \$25

107% → $\frac{\$25}{100} \times 107 = \$26.75$

The price of the bag after GST was \$26.75.

Annual Interest
Example: Sam deposits \$500 in a bank which offers 3% annual interest. How much money was in his account at the end of the year?
100% → \$500

103% → $\frac{\$500}{100} \times 103 = \$515$

There was \$515 in his account at the end of the year.

Summary Chart

Percentages

Expressing a part of a whole as a percentage
Example: Express 85 out of 100 as a percentage.

85 out of 100 = $\frac{85}{100}$

$\frac{85}{100} \times 100\% = 85\%$

Finding a percentage part of a whole
Example: What is 70% of $350?

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35% → 28 boys

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Example: Shirley weighed 48 kg last year. She weighs 42 kg now. What is the percentage decrease in her mass?

Decrease in her mass = (48 – 42) kg = 6 kg

% decrease in her mass = $\frac{6}{48} \times 100\%$

= 12.5%

Finding percentage increase
Example: Hazel was 150 cm last year. Her height increased to 153 cm this year. Find the percentage increase in her height.

Increase in height = (153 – 150) cm = 3 cm

% increase in height = $\frac{3}{150} \times 100\% = 2\%$

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100% → \$25

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The price of the bag after GST was \$26.75.

Annual Interest
Example: Sam deposits \$500 in a bank which offers 3% annual interest. How much money was in his account at the end of the year?
100% → \$500

$103\% \rightarrow \frac{\$500}{100} \times 103 = \$515$

There was \$515 in his account at the end of the year.

Topic: Ratio Key Concept 1: Difference constant

Example:

$\frac{2}{5}$ of the pupils in 6A are boys and the rest are girls. After 4 boys and 4 girls left the class, the ratio of the number of boys to the number of girls is 4 : 7.
How many pupils are left in the class in the end?

Boys	:	Girls	:	Difference
2	:	3	:	1
				×3
6	:	9	:	3
4	:	7	:	3

6 – 4 = 2

2u --- 4
u --- 2
11u --- 22

Ans: 22

Topic: Ratio

Key Concept 2: One item constant

Example:

During a school assembly, the ratio of the number of girls to the number of boys was 6 : 7. If 63 girls left the school hall, the new ratio of the number of girls to the number of boys became 9 : 14. How many pupils were there in the school hall at first?

Girls : Boys

6 : 7

×2

-63

12 : 14

9 : 14

12 – 9 = 3

3u --- 63

u --- 21

26u --- 546

- **Boys is constant**

Ans: 546

Topic: Ratio Key Concept 3: Repeated Identity

Example:

The ratio of the number of marbles Collin has to that of Joseph's is 2 : 3 and the ratio of the number of marbles Ryan has to that of Collin's is 1 : 4. If they have a total of 187 marbles altogether, how many marbles does Collin have?

Collin : Joseph
2 : 3
×2
4 : 6

Ryan : Collin
1 : 4

❖ Collin is repeated

Collin : Joseph : Ryan

4 : 6 : 1

11u --- 187
1u --- ~~17~~ 187 ÷ 11 = 17
4u --- 68 17 × 4 = 68

Ans: 68

Topic: Ratio | Key Concept 4: Total constant

Example:

Cherilyn was fixing a jigsaw puzzle. After 3 days, the ratio of the number of pieces she fixed to the number of pieces unfixed was 2 : 5. After another week, she managed to fix another 288 pieces and was left with $\frac{2}{10}$ of the puzzles unfixed. How many pieces did the puzzle consist of?

fixed	:	unfixed	:	Total
2	:	5	:	7
				×10
20	**:**	**50**	**:**	**70**
8	:	2	:	10
				×7
56	**:**	**14**	**:**	**70**

36 u → 288
1u → 8
70u → 560

Ans: 560

Topic: <u>Ratio</u> Key Concept 5: <u>Units and Parts</u>

<u>Example:</u>

The teacher-pupil ratio in a school is 1 : 40. The number of boys is $\frac{3}{8}$ the number of girls. There are 1600 girls. How many teachers are there in the school?

$$
\begin{array}{ccc}
\multicolumn{2}{c}{\text{Teacher: Pupil}} & \\
1 & : \ 40 & \text{Units} \\
 & \swarrow \quad \searrow & \\
 & \text{boys} \quad \text{girls} & \\
 & 3 \qquad\quad 8 & \text{Parts}
\end{array}
$$

8 parts ----- 1600
1 part ----- 200
11parts ----- 2200

40 u ---- 2200
1 u ---- 55

Ans: <u>55</u>

Topic: Ratio   Key Concept 6: Gap and Difference

Example:

Sierra and Jayde have some money each. If Sierra gave Jayde $240, they will have an equal amount of money. If Sierra gave Jayde $560, the ratio of her money to Jayde's money will be 1 : 3. How much does Sierra have at first?

The total amount of money remains the same. We adjust the ratios by making the total number of units in both cases the same.

Common multiple of 2 and 4 is 4.

Case 1:

Before **Sierra: 2u + 240**
Jayde: 2u – 240

Case 2:

Before **Sierra: u + 560**
Jayde: 3u – 560

Sierra $2u + 240 = u + 560$
$u = 320$

$320 + 560 = 880$

Ans: $880

Topic: Ratio   Key Concept 7: Number and Amount

Example:

A company has 400 employees. The ratio of the number of women to the number of men is 3 : 5. Each woman's pay is $\frac{5}{7}$ that of a man. If a man is paid $2100 a month, find the total salary of all the women in a month.

$3 + 5 = 8$

8u --- 400
u --- 50
3u --- 150

$\frac{5}{7} \times 2100 = 1500$

$150 \times 1500 = 225\,000$

	W	:	M	:	Total
Ratio	3	:	5	:	8
Number	150	:	250	:	400

Man's salary → 2100

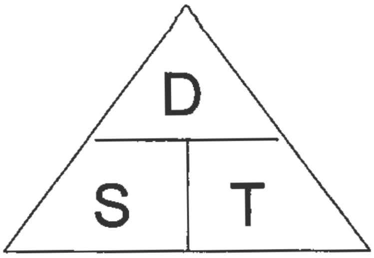
woman's salary → $\frac{5}{7} \times 21$

$1500 \times 150 = 225000$

Ans: $225 000

Mathematics Notes : Speed

The most important thing in Speed is : **KNOW THE FORMULAE**



Distance = Speed x Time

Speed $= \dfrac{\text{Distance}}{\text{Time}}$

Time $= \dfrac{\text{Distance}}{\text{Speed}}$

Do take note of the **units and do not give the wrong units**.

What does the difference in speed means?

Example: Car A travelled at 80km/h. Car B travelled at 60km/h

Interpretation:

a) If both vehicle starts at the same time, then for every 1 hour of travel, Car A will be ahead of Car B by 20km.

Thus after 2 hours, Car A will be 40km ahead of Car B
After 3 hours, Car A will be 60km ahead of Car B

b) If Car B started ahead of Car A, then for every 1 hour of travel, Car A can close the gap by 20km. Example: Car B started 1 hour earlier than Car A. Car B is 60km ahead of Car A.

After 1 hour, the gap between Car A and B is 40km
After 2 hours, the gap between Car A and B is 20km

c) If both vehicles come from opposite direction, then for every 1 hour of travel, the distance between them will be shorten by 140km.
If the distance between Car A and B is 300km at first,
After 1 hour, the distance between them is 160km.

Key Concept 1: Average Speed

Average speed is calculated using the following formula

$$\frac{total\ distance}{total\ time}$$

<u>Average speed is often used when the vehicle travels at different speed at different parts of the journey.</u>

Example:

1. Lisa drove at a uniform speed of 76km/h for 30 minutes and then at a uniform speed of 80km/h for 45 minutes. Find her average speed for the whole journey.

Solution :

Distance first part ----- $\frac{1}{2} \times 76 = 38$

Distance second part --------$\frac{3}{4} \times 80 = 60$

Total distance -------- 38 + 60 = 98

Total time ----------- $\frac{1}{2} + \frac{3}{4} = \frac{5}{4}$

Average speed ----- $98 \div \frac{5}{4}$ $= 98 \times \frac{4}{5}$

$= 78.4$

Ans : 78.4 km/h

Key Concept 2: Same Direction

Vocabulary used : Catch up, overtake

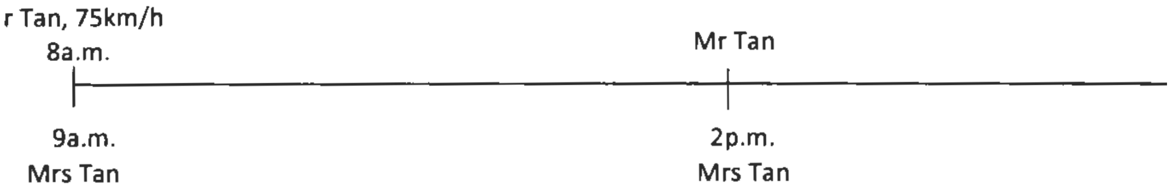
Meaning : both vehicle were at the same place at the same time.

Scenario, usually 2 vehicles with different speed and they start from the same point but at different times

Example:

1. Mr Tan left Town X at 8am travelling at 75km/h. Mrs Tan left Town X an hour later and overtook Mr Tan at 2pm along the same route. Find the speed Mrs Tan was travelling at.

Solution:



✓ Distance gap – 1 x 75 = 75

Time taken to overtake ---- 5h

Difference in speed ----- 75 ÷ 5 = 15

Mrs Tan's speed ----- 75 + 15 = 90

Ans: 90km/h

Method 2

Distance travelled by Mr Tan ------ 6 x 75 = 450

Time taken by Mrs Tan ----------- 5h

Speed of Mrs Tan --------- 450 ÷ 5 = 90

Ans: 90km/h

Key Concept 3: Opposite Direction

Vocabulary used : meet, pass,

Meaning : both vehicle were at the same place at the same time.

Scenario: Both vehicles starting from opposite side, usually with different speed and moving towards each other.

Example

At 2 p.m., Ray is driving from Town P to Town Q at a speed of 45km/h while John is driving from Town Q to Town P at 60km/h. Town P is 210 km from Town Q. At what time will they meet?

Solution :

2p.m., Ray 45km/h — 2p.m., John 60km/h

$$\underbrace{P \text{ ————————————————————— } Q}_{210\text{km}}$$

Sum of their speed – 45 + 60 = 105

This means, in 1h, both vehicles can cover 105km together.

Time taken ------- 210 ÷ 105 = 2

2h after 2p.m. is 4p.m.

Ans: 4 p.m.

Key Concept 4 : Journey with common distance/time

Notes : When the distance covered by two people (eg. A and B) are the same (common distance), the ratio of the individual person's (A) speed is opposite to the ratio of the individual person's (A) time

Eg.

Speed (A)		*Speed (B)*
3	:	*4*
Time (A)		*Time (B)*
4	:	*3*

Why? The faster the speed, the shorter the time taken to cover the same distance

Notes : When the travelling time of 2 persons are the same (common time), the ratio of the individual person's (A) speed is the same as the ratio of the individual person's (A) time

Eg.

Speed (A)		*Speed (B)*
3	:	*4*
Distance (A)		*Distance (B)*
3	:	*4*

Why? The faster the speed, the longer the distance travelled given the same amount of time.

SMILE Tutor
EFFICIENT . EFFECTIVE . EASY

Example

At 7 a.m., Roy started his run from Town Forks to Town Spoons at an average speed of 16km/h. 45 minutes later, Soy started cycling from Town Spoons to Town Forks at an average speed of 24 km/h. Both Roy and Soy reached their respective destination at the same time. What was the time taken by Roy to travel from Town Forks to Town Spoons?

Distance travelled ➔ Common

Speed (R)		***Speed (S)***
16	***:***	***24***
2	***:***	***3***
Time (R)		***Time (S)***
3	***:***	***2***

Difference in time taken ➔ 3 units -2 units = 1 unit

1 unit ➔ 45 min or $\frac{3}{4}$ h

Time taken by Roy ➔ 3 units ➔ $3 \times \frac{3}{4}$ h

$= \frac{9}{4}$ h

$= 2\frac{1}{4}$ h

Time taken by Roy was $2\frac{1}{4}$ h.

Speed

To find Distance, we use Speed x Time.

To find Speed, we use $\frac{\text{Distance}}{\text{Time}}$.

To find Time, we use $\frac{\text{Distance}}{\text{Speed}}$.

The Average Speed for the whole journey is found using $\frac{\text{Total Distance}}{\text{Total Time}}$.

JOURNEY BY PARTS

Example **Average Speed for the Whole Journey**

Alan ran at 5 km/h for 3 h and cycled another 24 km at 8 km/h.
Calculate his average speed for the whole journey.

Distance$_1$ → 5 km/h x 3h
= 15 km

Speed$_1$ → 5 km/h

Time$_1$1 → 3 h

Distance$_2$ → 24 km

Speed$_2$ → 8 km/h

Time$_2$ → $\frac{24}{8}$ h = 3 h

Average speed of whole journey → $\frac{\text{Total Distance}}{\text{Total Time}}$

→ $\frac{(15+24)}{6} = 6\frac{1}{2}$ km/h

A speed problem is classified under journey by parts when a journey is divided into different sections. It could be divided due to a change in speed during part of the journey, or a change in the modes of transport e.g. cycling followed by walking or interrupted by stoppage to take a rest along the journey.

It is important for pupils to remember that the average speed of the whole journey can only be calculated by taking the total distance divided by the total time. It cannot be found by taking the average of the different speeds.

JOURNEY IN SAME DIRECTION INVOVLING CATCHING UP

Abel starts walking from Point A at a speed of 4 km/h.
2 hours later, Jack rides his bicycle at 9 km/h along the same route.
How long will Jack take to catch up with Abel?

Abel *S – 4 km/h*

Point A

Jack *S – 9 km/h*
(2 hours later)

Abel started 2 hours earlier than Jack.

Abel's distance in that 2 h → 2 h x 4 km/h = **8 km**
Abel was ahead of Jack by 8 km

Jack's speed (9 km/h) is faster than Abel's speed (4 km/h)

Difference in their speed → 9 km/h – 4 km/h = **5 km/h**
(meaning for every hour that Jack travels, he covers 5 km more than Abel)

Time taken for Jack to catch up → (8 ÷ 5) h = $1\frac{3}{5}h$

JOURNEY IN OPPOSITE DIRECTION

Example
At 1 pm, Tom is driving from town P to town Q at a speed of 45 km/h while Jerry is driving from town Q to town P at 60 km/h. Town P is 210 km from town Q. At what time will they meet?

Tom → S- 45 km/h S- 60 km/h ← Jerry

Town P Town Q

210 km

In 1 hour,

Both Tom and Jerry can travel 45 km + 60 km = 105 km ***(i.e. their combined speed)***

Time to meet → time taken to complete entire distance from P to Q → $\frac{210}{105}$ h
= 2 h.

In speed problems with individual travelling in opposite direction, it is important to note that when they meet, they will cover the entire distance between them. That explains why we often add up their distance they can travel within a common time frame.

COMMON DISTANCE OR TIME

When the distance covered by 2 individuals are the same (common distance), the ratio of time taken is inversely related or opposite to the ratio of the individual's speed.

Eg.	Speed (R)	:	Speed (S)
	2	:	3
	Time (R)	:	Time (S)
	3	:	2

This is because the faster the speed, the shorter the time taken to cover the same distance and vice versa.

On the other hand, if the traveling time of 2 individuals are the same (common time), the ratio of distance covered is directly proportionate or the same as the ratio of the individual's speed.

Eg.	Speed (R)	:	Speed (S)
	2	:	3
	Distance (R)	:	Distance (S)
	2	:	3

This is because given the same amount of time, the faster the speed, the longer is the distance covered and vice versa.

Example

At 7a.m., Richard started his run from Town A to Town B at an average speed of 16 km/h. 45 minutes later, Sandra started cycling from Town B to Town A at an average speed of 24 km/h. Both Richard and Sandra reached their respective destinations at the same time. What was the time taken by Richard to travel from A to B?

Since they both travel the distance between Town A and Town B, distance travelled by both is the same.

Speed (Richard) : Speed (Sandra) $\rightarrow$ 16: 24 = 2:3
Time (Richard) : Time (Sandra) = 3:2

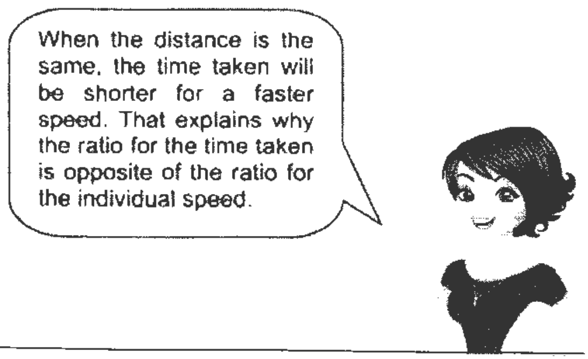
Difference in time taken $\rightarrow$ 1 unit $\rightarrow$ 45 minutes $\rightarrow \frac{45}{60}$ h = $\frac{3}{4}$ h

Time taken by Richard $\rightarrow$ 3 units

$\rightarrow 3 \times \frac{3}{4}$ h

$= \frac{9}{4}$ h

$= 2\frac{1}{4}$ h

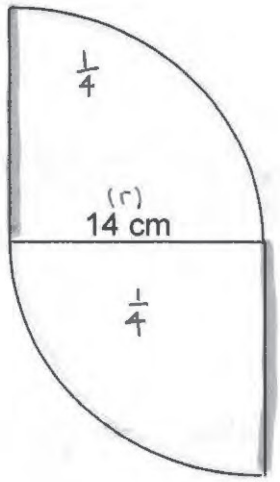


Topic: Circle Key Concept 1: Circumference

Example:

The figure is made up of two quarter circles.
Find its circumference.

(Take $\pi = \frac{22}{7}$)



$\frac{1}{2} \times \frac{22}{7} \times 28 = 44$

$44 + 14 + 14 = 72$

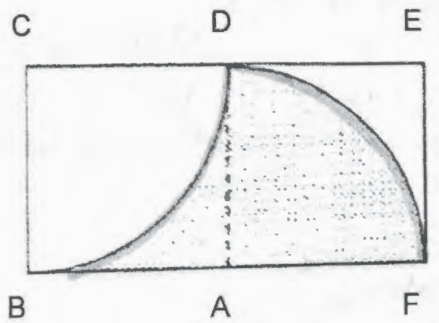
Ans : 72 cm

Topic: Circle

Key Concept 2: Circumference of composite figures

Example:

AD is a common side of the squares ABCD and ADEF. The length of AD is 10 cm. Find the perimeter of the shaded part. (Take $\pi = \frac{22}{7}$)



$\frac{1}{2} \times \frac{22}{7} \times 20 = 31\frac{3}{7}$

$31\frac{3}{7} + 20 = 51\frac{3}{7}$

Ans: $51\frac{3}{7}$ cm

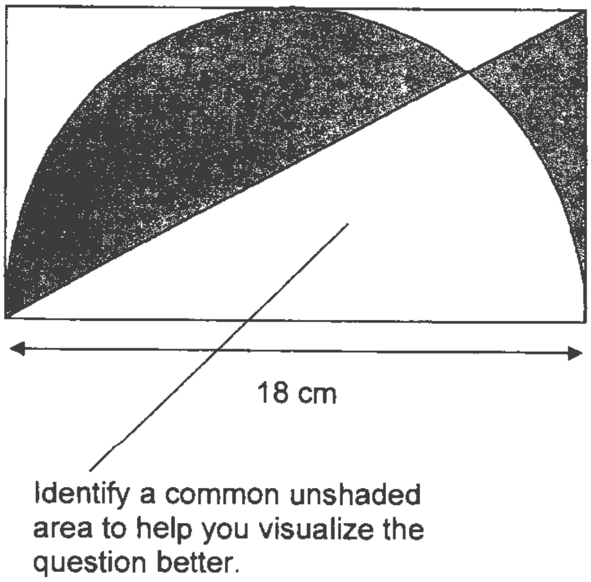
Topic: Circle

Key Concept 3: Overlapping circle

Example:

The figure below is made up of a rectangle and a semicircle in it. Find the difference in the area in the two shaded parts.

(Take $\pi = \frac{22}{7}$)



Note that radius of the semicircle is the breadth of the rectangle.

Breadth → 18 ÷ 2 = 9

Semicircle → $\frac{1}{2} \times \frac{22}{7} \times 9 \times 9 = 127\frac{2}{7}$

Triangle → $\frac{1}{2} \times 18 \times 9 = 81$

Difference in area → $127\frac{2}{7} - 81 = 46\frac{2}{7}$

Ans: $46\frac{2}{7}$ cm^2

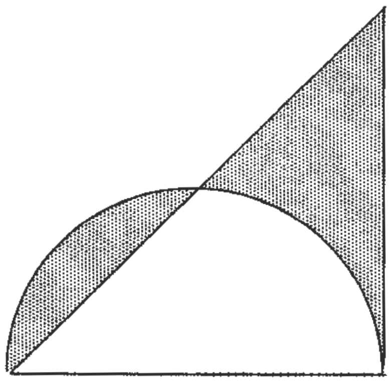
Topic: Circle

Key Concept 4: Cut-and-Paste

Example:

Find the total area of the shaded parts.

(Take $\pi = \frac{22}{7}$)



Area of big triangle

$= \frac{1}{2} \times 10 \times 10$

$= 50\ cm^2$

Area of shaded parts

$= \frac{1}{2} \times 50$

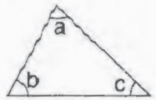
$= 25\ cm^2$

Summary Chart

Geometry

Properties of Triangles

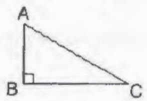
Triangle



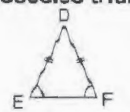
$\angle a + \angle b + \angle c = 180°$

Right-angled triangle

One of the angles is 90°.
- $\angle ABC = 90°$



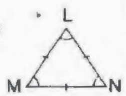
Isosceles triangle



It has 2 equal sides.
- DE = DF

The 2 base angles are equal.
- $\angle DEF = \angle DFE$

Equilateral triangle

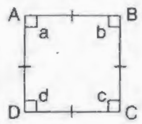


It has 3 equal sides.
- LM = MN = NL

All its angles are equal.
- $\angle LMN = \angle MNL = \angle NLM$

Properties of 4-sided Figures

Square

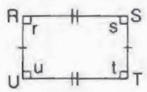


All 4 sides are equal.
- AB = BC = CD = DA

Opposite sides are parallel.
- AB // CD and BC // AD

All 4 angles are right angles.
- $\angle a = \angle b = \angle c = \angle d = 90°$

Rectangle

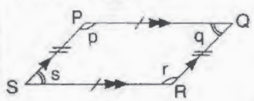


Opposite sides are equal.
- RS = UT and ST = RU

Opposite sides are parallel.
- RS // UT and ST // RU

All 4 angles are right angles.
- $\angle r = \angle s = \angle t = \angle u = 90°$

Parallelogram



Opposite sides are parallel.
- PQ = SR and QR = PS

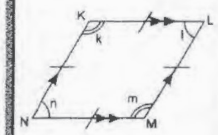
Opposite sides are equal.
- PQ // SR and QR // PS

Opposite angles are equal.
- $\angle p = \angle r$ and $\angle q = \angle s$

Sum of of angles between 2 parallel sides is equal to 180°.

$\angle p + \angle s = 180°$ $\angle q + \angle r = 180°$

Rhombus



All 4 sides are equal.
- KL = LM = MN = NK

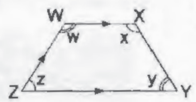
Opposite sides are parallel.
- KL // NM and LM // KN

Opposite angles are equal.
- $\angle k = \angle m$ and $\angle l = \angle n$

Sum of angles between 2 parallel sides is equal to 180°.

$\angle k + \angle n = 180°$ $\angle l + \angle m = 180°$

Trapezium

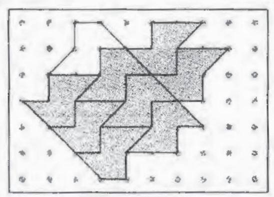


One pair of opposite sides is paraller.
- WX // ZY

Sum of angles between 2 parallel sides is equal to 180°.

$\angle w + \angle z = 180°$ $\angle x + \angle y = 180°$

Tessellation

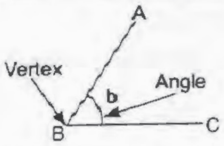


Summary Chart

Geometry

Angles

An angle is formed between two lines which meet at a point.

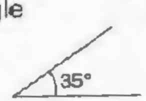


∠ABC or ∠CBA or ∠b

Angles are measured in degrees.

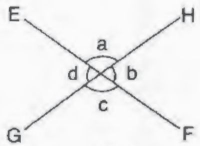
An angle can be a right angle

- Smaller than a right angle



- Bigger than a right angle

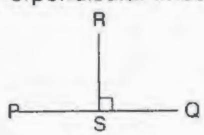
EF and GH are straight lines.



– $\angle a + \angle b = 180°$ (angles on a straight line)
– $\angle a + \angle b + \angle c + \angle d = 360°$ (angles at a point)
– $\angle a = \angle c$ and $\angle b = \angle d$ (vertically opposite angles)

Perpendicular and Parallel Lines

Perpendicular lines

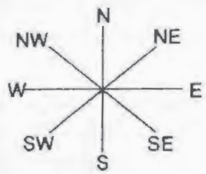


PQ ⊥ RS

Parallel lines

AB // CD

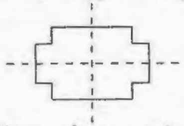
8-point Compass



Lines of Symmetry

1 line of symmetry

2 lines of symmetry

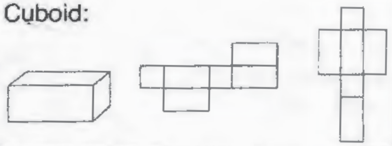


4 lines of symmetry

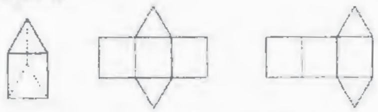
Nets

Cube:

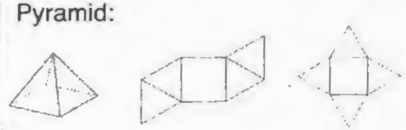
Cuboid:



Prism:



Pyramid:



**TESSELLATION NOTES &
PAST PSLE QUESTIONS**

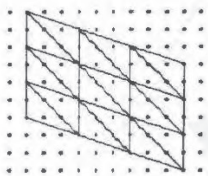
Name: ______________________ Class: P6 (   )   Date: ____________

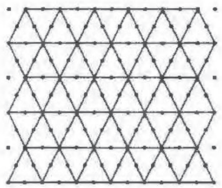
What is a Tessellation?

A tessellation is a **repeating** pattern made by fitting shapes together to cover a surface completely. The shapes **must not overlap** one another and there must be **no gaps** in the pattern formed.

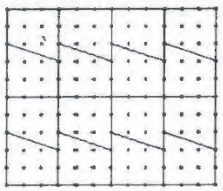
Some Useful Observations

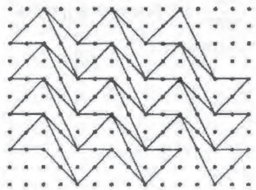
1. All triangles can tessellate.

Eg 1


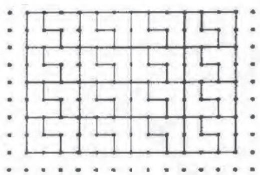
Eg 2


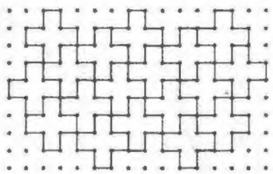
2. All quadrilaterals, i.e. 4-sided figures, can tessellate.

Eg 1


Eg 2


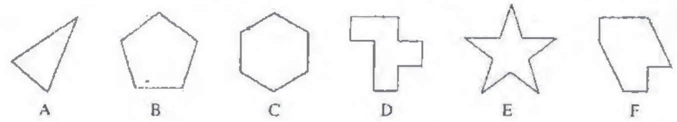
3. All shapes that are made from identical squares can tessellate.

Eg 1


Eg 2


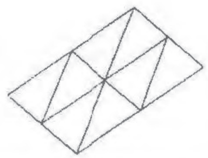
Example 1

Study each of the following shapes carefully. Identify the shapes that can tessellate.

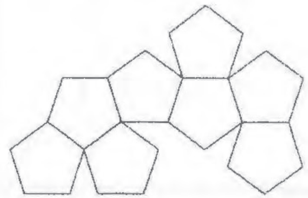


Solution

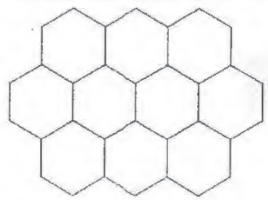
Only shapes A, C, D and F can tessellate.



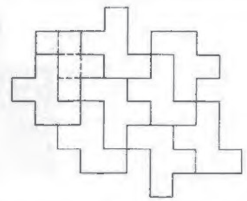
Here again it shows that a triangle can tessellate.



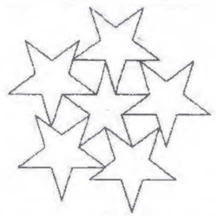
Notice that the gaps between the unit shapes cannot be filled up.



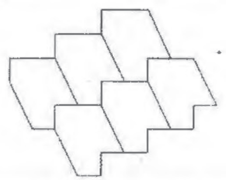
Doesn't this tessellation remind you of a bee hive?



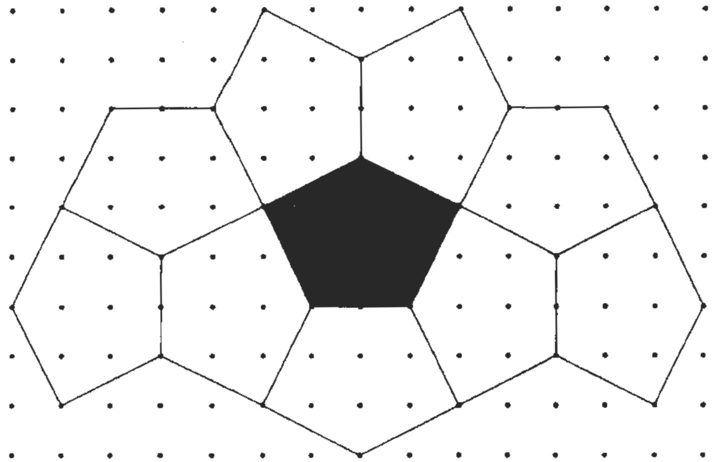
Notice that Shape D is made from identical squares.



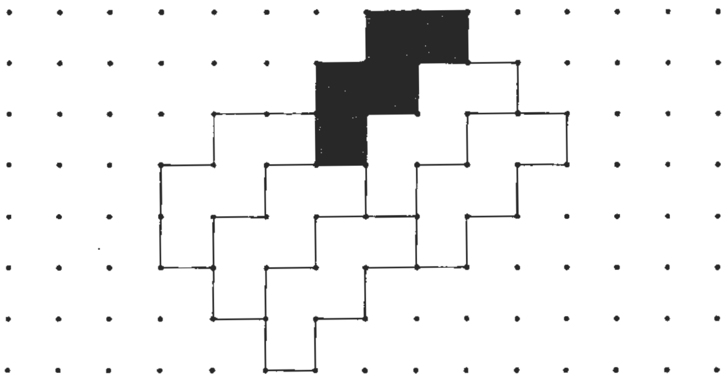
The gaps between the stars cannot be filled. Try fitting the stars in other ways and you will still find gaps in-between.



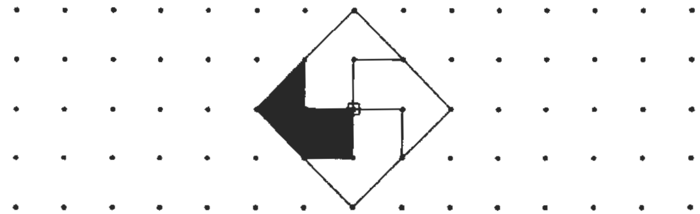
Notice that Shape F is modified from the dotted rectangle.



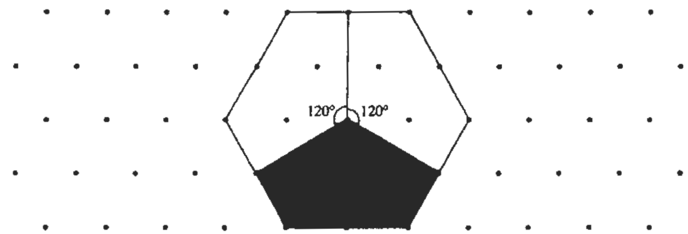
Note that only certain pentagons (5-sided figures) can tessellate.



Notice that the unit shape is made from identical squares.



$\frac{360°}{90°} = 4$. Notice that it takes 4 unit shapes form one complete round without leaving any gaps in-between.



$\frac{360°}{120°} = 3$. Notice that it takes 3 unit shapes to form one complete round without leaving any gaps in-between.