GCSE Mathematics
Intermediate Tier

Booklet 4

Fractions

Student's Name	
Lecturer's Name	
Mark	/
	☺ ☺ ☹
Student Reflection	

Make sure you show your methods and calculations.

Calculators are / are not to be used on this booklet.

FRACTIONS

Fractions are written in the form:

NUMERATOR
DENOMINATOR

Note:
The denominator tells us how many equal parts the whole was divided into.
The numerator tells us how many of these parts we have.

Equivalent Fractions
These are fractions that are equal in value but which are written in different ways.
Example

We can create equivalent fractions by **multiplying** both the numerator and denominator of the original fraction by the same number.

Example

$$\frac{1^{\times 2}}{2_{\times 2}} = \frac{2}{4}$$

Simplifying Fractions
Reversing the process of creating equivalent fractions allows us to simplify fractions-i.e. reduce them to their simplest form.

Simplifying fractions if often referred to as 'Cancelling Down'.

We simplify fractions by **dividing** both the numerator and denominator of the original fraction by a number that divides exactly in to both.

Example

$$\frac{15^{\div 5}}{20_{\div 5}} = \frac{3}{4}$$

## Improper Fractions

Fractions are *improper* if the numerator is bigger than the denominator.

Improper fractions can be converted to mixed numbers.

Examples

i) $\dfrac{3}{2}$ $=$ $1\,{}^1/_2$
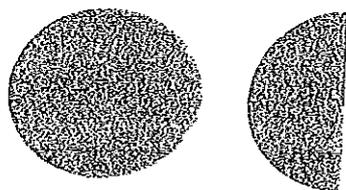
Converting Mixed Numbers to Improper Fractions

We reverse the process of converting improper fractions to mixed numbers.

Example

$2\,{}^3/_4$ $=$ $\dfrac{11}{4}$
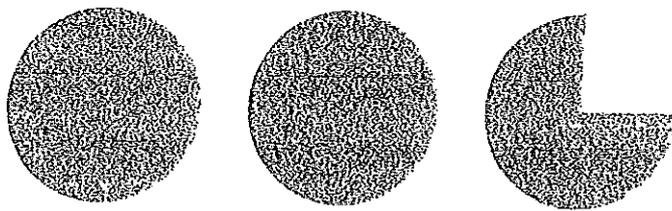
Adding and Subtracting Fractions

Fractions can easily be added or subtracted when their denominators are the same.

Example

$$\frac{3}{11} + \frac{4}{11} = \frac{7}{11}$$

If the denominators are different we must make them the same by creating equivalent fractions.

Example

$$\frac{4}{5} + \frac{3}{4} =$$

$$\frac{4}{5}^{\times 4}_{\times 4} + \frac{3}{4}^{\times 5}_{\times 5} = \frac{16}{20} + \frac{15}{20} = \frac{31}{20} = 1\frac{11}{20}$$

If mixed numbers are to be added or subtracted we must convert them to improper fractions first.

Example

$$5\frac{1}{3} - 2\frac{3}{5} = \frac{16}{3} - \frac{13}{5} = \frac{16^{\times 5}}{3^{\times 5}} - \frac{13^{\times 3}}{5^{\times 3}} = \frac{80}{15} - \frac{39}{15} = \frac{41}{15} = 2\frac{11}{15}$$

Multiplying Fractions

We multiply fractions by simply multiplying the numerators together and then the denominators together.

To make the calculation easier we should 'cancel down' before we start multiplying.

Notes : We can cancel any numerator with any denominator.

The word 'of' in maths means multiply.

All mixed numbers must be changed to improper fractions.

Example

$$3 \tfrac{3}{4} \times 2 \tfrac{1}{5} = \frac{15}{4} \times \frac{11}{5} = \frac{15 \times 11}{4 \times 5} = \frac{165}{20} = 8 \tfrac{5}{20} = 8 \tfrac{1}{4}$$

Dividing Fractions

Rules:
1. Convert any mixed numbers to improper fractions.
2. Write down the first fraction.
3. Change the sign from $\div$ to $\times$.
4. Turn the second fraction upside down.
5. Multiply the fractions.

Example

$$3 \tfrac{3}{4} \div 2 \tfrac{1}{5} = \frac{15}{4} \div \frac{11}{5} = \frac{15}{4} \times \frac{5}{11} = \frac{15 \times 5}{4 \times 11} = \frac{75}{44} = 1 \tfrac{31}{44}$$

1.   Shade $\frac{4}{5}$ of the following figure.
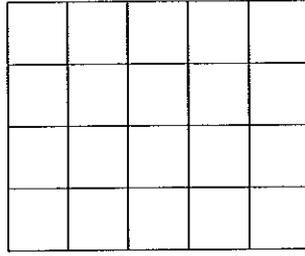
[1]

2.   (a)   What fraction of the following shape is shaded?
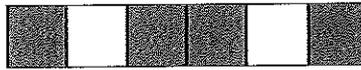
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[1]

(b)   What fraction of the following shape is shaded?
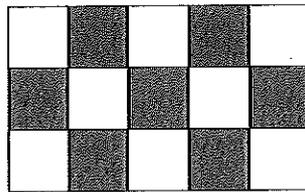
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[1]

3.   Draw a circle around **each** of the following fractions which **are** equal to $\frac{1}{5}$.

$$\frac{2}{10} \qquad \frac{5}{30} \qquad \frac{4}{20} \qquad \frac{10}{50} \qquad \frac{2}{12} \qquad \frac{7}{35}$$

[2]

4.   Draw a circle around **each** of the following fractions which **are not** equal to $\frac{1}{2}$.

$$\frac{3}{9} \qquad \frac{6}{12} \qquad \frac{2}{8} \qquad \frac{20}{30} \qquad \frac{15}{30} \qquad \frac{10}{25}$$

[2]

5. Convert all the fractions in the list below:

$$\frac{2}{3} \qquad \frac{1}{4} \qquad \frac{5}{6} \qquad \frac{1}{2} \qquad \frac{1}{6} \qquad \frac{3}{4}$$

so that they all have denominator 12:

$\frac{2}{3} = \frac{}{12}$	$\frac{1}{4} = \frac{}{12}$	$\frac{5}{6} = \frac{}{12}$
$\frac{1}{2} = \frac{}{12}$	$\frac{1}{6} = \frac{}{12}$	$\frac{3}{4} = \frac{}{12}$

[4]

Hence find two fractions from this list of fractions which :

(i)   add up to $\frac{3}{4}$

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[1]

(ii)   have a difference of $\frac{7}{12}$

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[1]

6.   The pie chart shows the results of a survey of people's favourite television channels.
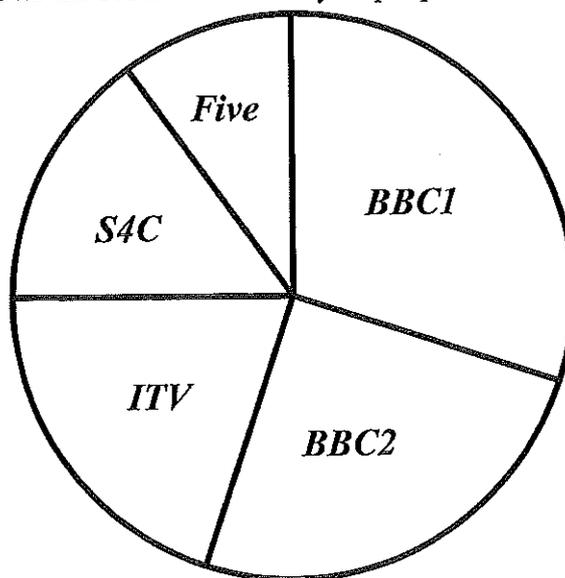
Pie chart drawn to scale.

(i)   What fraction of the people chose BBC2 as their favourite channel ?

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[1]

(ii)   In a town of population 28,000, how many people would you expect to choose BBC2 as their favourite channel ?

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[1]

7. Hannah earns £189 each week. She spends $\frac{2}{9}$ of this amount on food.

How much money does Hannah spend on food?

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[2]

8. Showing clearly how you decide, find which of the following fractions is closest to $\frac{3}{5}$.

$$\frac{13}{20} \qquad \frac{3}{4} \qquad \frac{7}{10}$$

The fraction which is closest to $\frac{3}{5}$ is ---

[2]

9. Find $\frac{3}{8}$ of £152.

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[2]

10. Which of the fractions $\frac{2}{3}$ and $\frac{3}{4}$ is the larger? Show your working.

The larger fraction is ---

[2]

11. Sam gives his dog $\frac{3}{4}$ of a tin of dog food each day. What is the least number of tins Sam needs to buy to feed his dog for 7 days?

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[3]

12. Find $\frac{3}{7}$ of 105 kg.

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[2]

13. A holiday costs £336 for an adult. The same holiday for a child costs $\frac{4}{7}$ of the adult price. How much does the holiday cost for one child?

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[2]

14. A primary school has 160 pupils and $\frac{4}{5}$ do not wear glasses.

(a) How many pupils in the school do not wear glasses ?

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[2]

(b) What fraction of the pupils do wear glasses ?

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[1]

15.   Water makes up $\frac{3}{5}$ of a drink. How much water is there in 560 ml of the drink?

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_____

_____

[2]

16.   John saved £600. He spent $\frac{1}{3}$ of this money on a bike, and $\frac{2}{5}$ of this money on clothes.
       What fraction of this money has he got left?

_____

_____

_____

_____

_____

_____

[4]

17.   When full, a jug holds $1\frac{1}{3}$ litres. How many times can the jug be completely filled from
       a 15 litre container?

_____

_____

_____

_____

_____

[3]

18. Tom is 60. His grandson Ryan is $\frac{1}{5}$ of his age, and his grand-daughter Sian is $\frac{4}{15}$ of his age. Which grand-child is the older, and by how many years ?

------------------ is the older by ------------------ years.

[3]

19. David and Jonathan try to estimate the amount of milk in a large container.

David says it is two and three fifths litres.

Jonathan says it is two and a third litres.

The label on the container says it holds two and a half litres.

Who was the closest, David or Jonathan? You **must** show all your working.

Answer: ---------------------------------------

[3]

20. Find $\frac{5}{6}$ of 42.

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[2]