GRAYS TUITION CENTRE – Online Tutoring

WEEK: 4

Week Beginning: (11/01/2021)

Subject: MATHS

Year: Year 9

Lesson Objective:

- Understanding percentage increase and decrease
- Be able to work out percentage change using formula
- Understanding the difference between simple and compound interest

Class Worksheets

- Page 26-27, 29-30, 31-33 GCSE Maths 4-9 Elmwood (Blue book)

Homework

- Completing classwork for homework

Additional Notes

- All homework from last week will be marked at the beginning of the lesson. Make sure that you have your homework with you in the lesson and are ready to mark it.
- Also prepare any questions if you struggled with the homework so I can help you.
- All lesson worksheets and **homework for next week (due Week 5)** worksheets can be found below
- All questions circled in red are the questions that you are supposed to do.

Key Facts

Using percentage multipliers

The quickest way to increase £7100 by 9% is $1{\cdot}09 \times 7100 = £7739$

$100\% + 9\% = 109\% = 1{\cdot}09$ (percentage multiplier)

Decrease a price of £620 by 3%:

$100\% - 3\% = 97\% = 0{\cdot}97$ (percentage multiplier)

Answer: $0{\cdot}97 \times 620 = £601{\cdot}40$

M2.1

Use a calculator when needed.

1. 9% of a cereal is sugar. How much sugar is there in a 750 g box of cereal?

2. Which is larger:

   A 7·3% of £8·99 or B 9·4% of £6·81

3. Rory earns £22 000 each year. He gets a pay rise of 4%. How much does he now earn each year?

4. A railcard gives a 20% discount. How much would a £9·65 train journey cost if the railcard was used?

5. The population of Hatton is 11 500. If the population decreases by 2%, what is the new population?

6. Write down the percentage multiplier that would be used for the following (e.g. 'increase of 4%' means the percentage multiplier is 1·04).

   (a) Increase of 25%
   (b) Increase of 17·5%
   (c) Decrease of 6%
   (d) Reduction of 3·5%
   (e) Decrease of 63%
   (f) Increase of p%

7 What is the sale price for each item below?

(a) Digital radio £90
SALE
$33\frac{1}{3}$% off

(b) Bed £450
SALE
35% off

8 A new car costs £2320 + VAT (20%).
Its value decreases by 27% after one year.

(a) What is the total price of the new car?

(b) How much does the car cost after 1 year?

9 70% of the people in a supermarket are over 50 years old.
60% of the over 50s buy some fruit.
40% of the 50s or under people buy some fruit.
What percentage of the people in the supermarket did not buy some fruit?

Can you still?

Surds
Do not use a calculator

1. Simplify

(a) $\sqrt{48}$ (b) $\sqrt{48} - \sqrt{12}$

(c) $\frac{7}{\sqrt{7}}$ (d) $(\sqrt{3} + 1)^2$

2. Which is greater and by how much?

$(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2})$

or $6\frac{3}{5} - 1\frac{2}{3}$

10 A suitcase costs £275 + VAT (20%). After a year-and-a-half the shop puts the suitcase in a sale when the price is reduced by 15%.
How much does the suitcase cost in the sale?

11 Alma and Jack each buy a bike for £550 + VAT (20%).
Alma's bike loses 20% of its value at the start of each year.
During the first year Jack's bike loses 15% of its value at the start of the year.
During the second year Jack's bike loses 25% of its value at the start of the year.
Which bike is worth the most after 2 years and by how much?

12 Trinity says 'If I increase £160 by 8% then decrease the result by 8%, the answer will not be £160'. David disagrees. Explain fully who is correct.

(a) A holiday firm reduces its price of a holiday from £1740 to £1479.

Find the percentage decrease.

actual decrease $= 1740 - 1479$

$= 261$

Percentage decrease $= \left(\frac{261}{1740}\right) \times 100$

$= 15\%$

(b) Roger buys a box of shirts for £180 and sells them for £232·20.

Find the percentage profit.

actual profit $= 232{\cdot}20 - 180$

$= 52{\cdot}20$

Percentage profit $= \left(\frac{52{\cdot}20}{180}\right) \times 100$

$= 29\%$

M2.2

Use a calculator when needed.
Give answers to one decimal place if necessary.

1. Eddie's wages were increased from £120 to £129·60 per week. What was the percentage increase?

2. A clock is bought for £60 and sold for £69. What is the percentage profit?

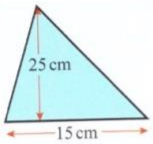
3. The value of a bike drops from £240 to £160 in one year. What is the percentage decrease in that year?

4. The population of a country increases from 2,374,000 to 2,445,220. What is the percentage increase?

5. On average $2\frac{1}{2}$ days out of every 60 working days are missed through ill health at the Henton factory. $\frac{3}{20}$ of the missed days are due to back problems. What percentage of all the working days at the factory are missed due to back problems?

6. The 'King's Arms' pub buys some of its items at the costs shown below and sells them at the prices shown below. Find the percentage profit on each item.

Item	Cost price	Selling price
Pint of lager	£1·20	£2·70
Packet of crisps	25p	60p
Pint of bitter	£1·15	£2·50
Packet of nuts	27p	75p

7 

The base and height are both increased by 20%.
What is the percentage increase in the area of the triangle?

8 The cost of a first-class stamp is increased from 28p to 29p.
What is the percentage increase?

9 Arnie the grocer bought 100 cabbages at 30p each. He sold 80 of the cabbages at 65p each. The other 20 cabbages went 'rotten' and had to be thrown away. Find the percentage profit Arnie made on the 100 cabbages.

Can you still?

Decimals
Do not use a calculator

Work out:

1. $42{\cdot}6 - 3{\cdot}712$ **2.** $0{\cdot}72 \div 0{\cdot}8$

3. $0{\cdot}48 \div 0{\cdot}15$ **4.** $0{\cdot}6^2 - 0{\cdot}179$

5. $\dfrac{0{\cdot}12 - 0{\cdot}0282}{0{\cdot}34}$ **6.** $\dfrac{0{\cdot}72 + 0{\cdot}45}{0{\cdot}72 + 0{\cdot}18}$

7. Marcus has £50. He needs to buy 7 calculators each costing £5·39 and a book costing £12·25. Does he have enough money?

10 In 2014 a company makes a profit which is 25% higher than in 2013. In 2015 the profit drops back to the level of 2013. What was the percentage decrease from 2014 to 2015?

M Compound interest – type problems

£2000 is invested at 10% per annum (year) *compound* interest. How much money will there be after 2 years?

'Compound' interest here means that the interest must be worked out separately for each year.

After 1 year: total money = 2000 + 10% of 2000 = £2200

(or $1{\cdot}1 \times 2000$)

↑

'percentage multiplier' = 100% + 10% = 110% = 1·1

After 2 years: total money = 2200 + 10% of 2200 = £2420

money at start of 2nd year

(or $(1{\cdot}1 \times 2000) \times 1{\cdot}1 = 1{\cdot}1^2 \times 2000 = £2420$)

money after 1 year — 'percentage multiplier' for the 2nd year

Key Facts

If interest rate $= r\% = \frac{r}{100}$

multiplier $= 1 + \frac{r}{100}$

amount invested = P (called the 'principal')

total compound interest accrued (gained)

after n years $= P\left(1 + \frac{r}{100}\right)^n$

Simple interest

This means work out the interest for one year then multiply by the number of years.

£2000 is invested at 10% per annum (year) *simple* interest. How much money will there be after 2 years?

Interest = 10% of 2000 = 200

Total interest for 2 years = $200 \times 2 = 400$

Total money after 2 years = 2000 + 400 = £2400

M2.3

Use a calculator when needed.
Give answers to the nearest penny if necessary.

1 Ben invests £6000 in a bank at 5% per annum compound interest. How much money will he have in the bank after 2 years?

2 A bank pays 6% per annum compound interest. How much will the following people have in the bank after the number of years stated?

(a) Kim: £9000 after 2 years.
(b) Freddie: £4000 after 3 years.
(c) Les: £2500 after 8 years
(d) Olive: £600 after 10 years.

3 A stereo loses 30% of its value every year.
Tim bought it for £800. How much would it be worth after:

(a) 2 years.
(b) 3 years.

4 The population of a country decreases by 4% every year. If the population is 8 million, what will it be after 3 years?

11 Misha invests £4000 in a bank with a compound interest rate of 3·75% per annum.
At the end of each year Misha has to pay 20% tax on the interest made during that year.
After 4 years Misha finds a ruby stone valued at £4500. Has he got enough money in the bank to afford to buy the ruby stone?
If not, how much more would he need to save?

12 If a 15-year old person put £500 in a bank at 9% p.a. compound interest and left it in the bank for 50 years until retirement, how much money would be in the bank?

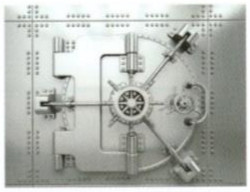
13 Arnav invests £500 at a compound interest rate of 4% per annum. At the same time Simone invest £600 at a compound interest rate of 2% per annum. At the end of which year will Arnav have more money than Simone for the first time?

14 The number of burglaries in a certain country rose by 8% for two years in a row from 2013 to 2015. If there were 20 000 burglaries in 2013 then:

(a) How many burglaries were there in 2014?

(b) How many burglaries were there in 2015?

(c) What was the overall percentage increase in burglaries over the two years?
(Note: the answer is *not* 16%.)



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Callow Bank offers two 3 year Savings accounts.

Simple Save: 2% per annum compound interest

Changer Save: 1% for first year
2% for second year
3% for third year

If you invest £3500 in each account, which will give you more money after 3 years and by how much?