

Lesson 17: The stock market

Goals

- Apply operations with rational numbers to calculate a stock's new value, change in value, or change expressed as a signed percentage of the previous value.
- Compare (orally and in writing) changes in the value of different stocks, including the amount and the percentage of the previous value.
- Interpret (orally) tables that represent the values of different stocks in the stock market.

Learning Targets

- I can solve problems about the stock market using rational numbers and percentages.

Lesson Narrative

Previously, students worked with percent increase and decrease. In this lesson, students see how signed numbers can be applied to representing changes in the stock market. This includes representing a decrease (in the price of an individual stock or the value of a stock portfolio) as a negative percentage of the original value.

The names given in the activities are generic, and the data is based on real stock market data from 2016. You may wish to replace them with up to date real companies and data.

Addressing

- Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- Solve real-world and mathematical problems involving the four operations with rational numbers. Calculations with rational numbers extend the rules for manipulating fractions to complex fractions.

Instructional Routines

- Stronger and Clearer Each Time
 - Co-Craft Questions
 - Discussion Supports
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Required Materials

Copies of blackline master

Stock Prices

company name	price (£)
Marine Exploration Company	2.02
Drilling Products Company	2.18
Solar Power Company	3.07
Office Supply Company	3.31
Headphone Company	6.14
Home Appliance Company	6.74
Renewable Energy Company	8.83
Sporting Goods Company	9.27
Health Food Company	9.53
Fast Food Company	9.62
Shoe Company 1	11.28
Bookstore Company	11.35
Sports Technology Company	12.22
Teddy Bear Company	13.42
Microtechnology Company	13.76
Clothing Company 1	15.93
Social Media Company	16.91
Clothing Company 2	17.81
Clothing Company 3	21.22
Online Retail Company	23.41

company name	price (£)
Video Game Company	26.58
Clothing Company 4	27.50
Movie Theatre Company	27.61
Shoe Company 2	29.72
Biotechnology Company	29.79
Genetics Company	30.60
Automotive Company	31.46
Grocery Store Company	36.79
Clothing Company 5	38.05
Sports Clothing Company	40.13
Household Goods Company	43.22
Restaurant Company	48.14
Computer Company	51.17
Amusement Park Company	57.95
Jewellery Company	60.64
Pizza Company	68.00
Cereal Company	71.32
Megastore Company	73.02
Clothing Company 6	89.62
Farm Supply Company	91.18

Changes in Stock Prices after 3 Months

company name	change (£)	company name	change (£)
Marine Exploration Company	+1.57	Video Game Company	+1.01
Drilling Products Company	-1.23	Clothing Company 4	+7.02
Solar Power Company	+0.09	Movie Theatre Company	+3.48
Office Supply Company	+0.26	Shoe Company 2	-6.82
Headphone Company	+0.20	Biotechnology Company	+37.26
Home Appliance Company	-1.81	Genetics Company	-10.02
Renewable Energy Company	-0.36	Automotive Company	+16.72
Sporting Goods Company	+4.34	Grocery Store Company	-7.11
Health Food Company	+6.47	Clothing Company 5	+13.83
Fast Food Company	+1.18	Sports Clothing Company	-1.45
Shoe Company 1	-2.99	Household Goods Company	-0.11
Bookstore Company	-0.05	Restaurant Company	+1.92
Sports Technology Company	+2.62	Computer Company	+6.43
Teddy Bear Company	-3.06	Amusement Park Company	-4.34
Microtechnology Company	+4.02	Jewellery Company	+11.99
Clothing Company 1	+1.93	Pizza Company	+10.85
Social Media Company	+6.14	Cereal Company	-7.44
Clothing Company 2	-1.92	Megastore Company	-0.90
Clothing Company 3	+1.02	Clothing Company 6	+11.52
Online Retail Company	+9.49	Farm Supply Company	-23.83

Required Preparation

Print the Your Own Stock Portfolio blackline master. Each student will need 1 set of copies.

Student Learning Goals

Let's learn about the stock market.

17.1 Revisiting Interest and Depreciation

Warm Up: 5 minutes

The warm-up reminds students of their understanding of percentage increase and decrease in preparation for the shares questions later in the lesson. Some students will use different strategies; identify those for the discussion after the activity.

Launch

Remind students that they can use any strategies from Year 7 for answering the percentages questions.

Anticipated Misconceptions

If students forget about using an equation to calculate percent increase or decrease, remind them that they can use the equation $y = kx$ to figure out the answers to the questions.

Student Task Statement

1. Lin deposited £300 in a savings account that has a 2% interest rate per year. How much is in her account after 1 year? After 2 years?
2. Diego wants to sell his bicycle. It cost £150 when he bought it but has depreciated by 15%. How much should he sell it for?

Student Response

1. After one year: $300 \times 1.02 = 306$, After two years: $306 \times 1.02 = 312.12$; so she has £312.12 in her account.
2. $150 \times 0.85 = 127.5$ so £127.50.

Activity Synthesis

The most important thing is to recall efficient methods of calculating percent increase and decrease, such as setting up an equation in the form A% of B is C. Select students to share their methods in preparation for the next activity.

17.2 Gains and Losses

10 minutes

Students are introduced to the idea of the stock market and how the value changes. They apply their understanding of negative numbers to percentage change as well as money.

Instructional Routines

- Co-Craft Questions

Launch

Introduce the concept of shares in a company. They have a specific value at a specific time that can change up or down. They represent a measure of the worth of the company. We sometimes express the change as a value in pounds or dollars, so investors can see how much money they will make or lose. We can also present these as a percentage to compare companies in terms of growth.

Before students begin working on the task consider asking how they would represent an increase or decrease in value so that it was easily apparent.

To familiarise students with the information in the table, consider asking which companies' stocks increased in value and which companies' stocks decreased in value from day 1 to day 2. Have students explain their reasoning and come to an agreement before anyone begins doing calculations.

Representation: Internalise Comprehension. Activate or supply background knowledge. Allow students to use calculators to ensure inclusive participation in the activity.
Supports accessibility for: Memory; Conceptual processing Writing, Conversing: Co-craft Questions. Without revealing the questions that follow, display the table from the print statement for all to see. Give students 1–2 minutes to interpret the table, and write down possible mathematical questions that could be asked about the situation. Invite students to compare their questions with a partner before selecting 2–3 to share with the class. This will draw students' attention to the relationships between the four quantities in this task, and provide an opportunity for them to produce the language of mathematical questions.
Design Principle(s): Cultivate conversation

Student Task Statement

- Here is some information from the stock market in September 2016. Complete the table.

company	value on day 1 (pounds)	value on day 2 (pounds)	change in value (pounds)	change in value as a percentage of day 1 value
Mobile Tech Company	107.95	111.77	3.82	3.54%
Electrical Appliance Company		114.03	2.43	2.18%
Oil Corporation	26.14	25.14		-3.83%
Department Store Company	7.38	7.17		
Jewellery Company		70.30		2.27%

- Which company's change in pounds had the largest magnitude?
- Which company's change in percentage had the largest magnitude?

Student Response

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company	value on day 1 (pounds)	value on day 2 (pounds)	change in value (pounds)	change in value as a percentage of day 1 value
Mobile Tech Company	107.95	111.77	3.82	3.54
Electrical Appliance Company	111.6	114.03	2.43	2.18

Oil Corporation	26.14	25.14	-1.00	-3.83
Department Store Company	7.38	7.17	-0.21	-2.85
Jewellery Company	68.74	70.30	1.56	2.27

- Mobile Tech Company's change has the largest magnitude.
- Oil Corp's change as a percentage of its original value had the largest magnitude.

Activity Synthesis

The important part of this activity is that students use a directed quantity for percentage change to model decrease in value as negative and increase as positive. Ask students how they would prefer the information to be presented, and ask them to support their conclusions.

17.3 What is a Stock Portfolio?

15 minutes

This task introduces the concept of a stock portfolio being a selection of stocks an investor might own to try to make money—students examine the change in portfolio and evaluate the value. They must use both positive and negative change, and percentage change.

Instructional Routines

- Discussion Supports

Launch

Introduce the concept of a portfolio of shares in a company.

Engagement: Develop Effort and Persistence. Encourage and support opportunities for peer interactions. Invite students to talk about their ideas with a partner before writing them down. Display sentence frames to support students when they explain their strategy. For example, “In order to calculate the total value, first I ___ because...” or “The portfolio increased/decreased because....”

Supports accessibility for: Language; Social-emotional skills Representing, Listening: Discussion Supports. Demonstrate how to complete the first row of the second table about Technology Company’s total value, as you think aloud. Students can listen to your mathematical language and reasoning as you describe what the price change represents and find the new price, then calculate the total value. This will help invite more student participation, conversations, and meta-awareness of language involving representing financial situations of the stock market with positive and negative change and percentage change.

Design Principle(s): Support sense-making; Maximise meta-awareness

Student Task Statement

A person who wants to make money by investing in the stock market usually buys a portfolio, or a collection of different stocks. That way, if one of the stocks decreases in value, they won't lose all of their money at once.

- Here is an example of someone's stock portfolio. Complete the table to show the total value of each investment.

name	price (pounds)	number of shares	total value (pounds)
Technology Company	107.75	98	
Airline Company	133.54	27	
Film Company	95.95	135	
Sports Clothing Company	58.96	100	

- Here is the same portfolio the next year. Complete the table to show the new total value of each investment.

company	old price (pounds)	price change	new price (pounds)	number of shares	total value (pounds)
Technology Company	107.75	+2.43%		98	
Airline Company	133.54	-7.67%		27	
Film Company	95.95		87.58	135	
Sports Clothing Company	58.96	-5.56%		100	

- Did the entire portfolio increase or decrease in value over the year?

Student Response

- and 2.

name	price (pounds)	number of shares	total value (pounds)
Technology Company	107.75	98	10 559.50
Airline Company	133.54	27	3 605.58
Film Company	95.95	135	12 953.25
Sports Clothing Company	58.96	100	5 896

name	old price (pounds)	price change	new price (pounds)	number of shares	total value (pounds)
Technology Company	107.75	+2.43%	110.37	98	10 816.26
Airline Company	133.54	-7.67%	123.30	27	3 329.10
Film Company	95.95	-8.72%	87.58	135	11 823.30
Sports Clothing Company	58.96	-5.56%	55.68	100	5 568

3. The portfolio has decreased in total value from £33 014.33 to £31 536.66.

Activity Synthesis

The important part of this activity is that it extends on the context previously examined, ahead of students building their own portfolio in a later activity.

17.4 Your Own Stock Portfolio

15 minutes

Distribute copies of the "Stocks Prices"

Students calculate their own portfolio

Distribute copies of the "Changes in Stock Prices after 3 Months" so they can calculate the change.

Instructional Routines

- Stronger and Clearer Each Time

Launch

Distribute copies of the Stock Prices Blackline Master. Have prepared the Changes in Stock Prices after 3 Months Blackline Master.

Action and Expression: Internalise Executive Functions. To support development of organisational skills, check in with students within the first 2-3 minutes of work time. Check to make sure students show calculations for the total value of their portfolio as to not go over £100.

Supports accessibility for: Memory; Organisation

Student Task Statement

Your teacher will give you a list of stocks.

1. Select a combination of stocks with a total value close to, but no more than, £100.
2. Using the new list, how did the total value of your selected stocks change?

Student Response

1. Answers vary.
2. Answers vary.

Activity Synthesis

Have students trade with a partner and check each other's work. (Answers vary because each student worked with a different selection of stocks.)

Have students examine the "Changes in Stock Prices after 3 Months" page and discuss:

- How can you tell if the price of a stock increased or decreased from looking at this list?
- Which company's stock price increased or decreased by the most?
- Without doing any calculations, predict which company's stock price had the largest increase as a percentage of its starting value.
- Without doing any calculations, predict which company's stock price had the largest decrease as a percentage of its starting value.

Writing, Speaking: Stronger and Clearer Each Time. Use this routine to give students a structured opportunity to revise and refine their initial response to: "Using the new list, how did the total value of your selected stock change?". Ask students to meet with 2–3 other partners in a row for feedback. Provide students with prompts for feedback that will help pairs strengthen their ideas and clarify their language (e.g., "What is a quantity that changed?", and "What other details are important?", etc.). Students can borrow ideas and language from each partner to strengthen their final response.

Design Principle(s): Optimise output (for description)

Lesson Synthesis

Key learning points:

- There are a number of contexts in which using negative numbers to represent directed change is important; the stock market is one of them.
- Percentage change down can be represented with a negative percentage

Discussion questions:

- Which way of showing the change do you prefer, percentage or monetary value?
- Can you think of other situations in life where using a negative to represent a change would be useful?



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