



Southern Africa

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MATHS
Grade 7
NELSPRUIT, MPUMALANGA
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Grade 7 Priority Topic: Converting between SI Units

Proportions

1. If I can peel 12 apples in 8 minutes, how long will it take me to peel 6 apples at the same rate?
2. (Continuation) How many apples can I peel in 1 minutes?
3. (Continuation) A *proportion* is an equation stating that two ratios are equivalent. Using your answers to the two previous problems, write three equivalent ratios.
4. Ryan took 25 seconds to type the final draft of a 1000-word English paper. How much time should Ryan expect to spend typing the final draft of a 4000-word History paper?
5. (Continuation) The *proportion* $\frac{25}{1000} = \frac{x}{4000}$ is helpful for the previous question. Explain this proportion, and assign units to all four of its members.
6. If I run 100m in 20 seconds, how many metres can I run in 40 seconds at that rate?
7. (Continuation) If I run 100m in 20 seconds, how many metres can I run in 10 seconds at that rate?
8. (Continuation) If I run 100m in 20 seconds, how many metres can I run in 50 seconds at that rate?
9. (Continuation) If I run 100m in 20 seconds, how many metres can I run in 1 second at that rate?
10. (Continuation) If I run 100m in 20 seconds, how many seconds will it take me to run 200m at that rate?
11. (Continuation) If I run 100m in 20 seconds, how many seconds will it take me to run 20m at that rate?
12. (Continuation) If I run 100m in 20 seconds, how many seconds will it take me to run 1 metre at that rate?
13. Claire is taking a trip from Stratford to Paris, and she needs to exchange 500 British pounds for euros. The exchange rate is 1 pound to 1.23 euros. How many euros will she receive in this exchange?
14. When Aviva went to Tanzania, she estimated that she would need about 1.6 million Tanzanian shillings for her trip. The exchange rate at the time was one U.S. dollar to 2143 shillings. How many U.S. dollars did Aviva need to make this exchange?
15. A blueprint of a building gives a scale of 1 inch = 8 feet. If the blueprint shows the building sitting on a rectangle with dimensions 16 inches by 25 inches, what are the actual dimensions of the building? What is the actual area of the building?

SI Units

16. There are 1 000 metres in 1 kilometre. How many metres are in 5 kilometres?
17. How many kilometres are there in 7 000 metres?
18. How many metres are in 3.5 kilometres?
19. There are 100 centimetres in 1 metre. How many centimetres are there in 14.29 metres?
20. How many centimetres are there in 1 kilometre?
21. On a road map of Uganda, the scale is 1 : 1 500 000. The distance on the map from Kampala to Ft. Portal is 17cm. What is the real world distance in km between these two cities?
22. There are 10 millimetres in 1 centimetre. How many millimetres are there in a kilometre?
23. Each side of a square plot of land is 1 kilometre. What are its dimensions in metres? What is its area in m^2 ?
24. On a map of South Asia, Nepal looks approximately like a rectangle measuring 8.3 cm by 2.0 cm. The map scale is listed as 1 : 9 485 000.
 - (a) What are the approximate real world dimensions of Nepal in centimeters?
 - (b) What are the approximate real world dimensions of Nepal in kilometers?
 - (c) What is the approximate real world area of Nepal in km^2 ?
25. Given the task of converting $5 km^2$ into cm^2 , Rehman did the following set of calculations:

$$5km^2 \times \frac{1000m}{1km} \times \frac{1000m}{1km} \times \frac{100cm}{1m} \times \frac{100cm}{1m} = 5 \times 1000 \times 1000 \times 100 \times 100 cm^2 = 5 \times 10^{10} cm^2$$

What do you think of his approach?

26. Convert $23000 mm^3$ into m^3 .
27. One cubic centimetre is also called one millilitre. One thousand millilitres are in one litre and one thousand litres are in one kilolitre. How many cubic *metres* are in one kilolitre?

Activities

Counting Steps

“A journey of a thousand kilometres begins with a single step.” This saying is the basis for the following activity during which students use unit conversion and simple proportions to estimate how many of their steps are in a thousand kilometres.

Materials:

- A ruler with centimetre markings

Steps:

1. Tell the students the saying and ask them to estimate how many steps they would each need to take to walk 1000 kilometres using the ruler with centimetre markings.
2. Let them struggle and exercise their problem solving skills. If they get stuck, here are some questions to ask to prompt them in the right direction:
 - (a) How many centimetres are in a single one of your steps?
 - (b) How many metres are in a single step?
 - (c) How many steps are in a single metre? (They can use a simple proportion here)
 - (d) How many steps are in a kilometre?
 - (e) How many steps are in 1 000 kilometres?

Answers will vary but should all be around the same.

Estimating Capacity

In this activity, students will determine approximately how many candies various boxes can hold.

Materials:

- A beaker with a known capacity (500ml, 1l, etc.)
- Smarties or similar candy
- Ruler with mm markings
- Boxes of various sizes such as cereal boxes, a jewelry box, and so forth

Steps:

1. Fill the beaker with the candy.
2. Pour the candy out and have the students count how many pieces fit into the beaker. This provides a density.
3. Give the students the dimensions of the boxes in **meters**.
4. Have the students determine the volume of the boxes in **cm³**.

5. Ask the students to determine approximately how many pieces of candy will fit in the box. They will need to use the idea that $1\text{cm}^3=1\text{ml}$.
6. (*Optional*) Check their estimates by filling the boxes with candy and determining exactly how many pieces of candy fit in the box. Ask them to discuss why their answers were different from the actual amount.

Prelude: Workshop focus considerations
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Grade 7, Probability (as subset of data handling)

- I. Brainstorming and exchange
- II. Introduction
 - A) constructing a sample space
 - 1. using tables and tree diagrams to help
 - B) Definition of probability
 - 1. two coins; two dice and their sums; graduate to three births
 - 2. evaluating respective probabilities
 - C) Probability is a number--sliding scale
 - 1. Placing words, impossible, even chance, certain, somewhat likely, somewhat unlikely, "possible"
- III. Analytic aids
 - A) Venn diagrams
 - B) Tree diagrams
 - 1. following through branches with multiplication
 - a) adding outcomes in the end
 - i. application of addition rule
- IV. Addition rule: not examinable directly, but emphasized later
 - A) Definition
 - B) Illustrate with large groups--avoid major errors of double counting

P1 What kinds of questions can we ask to get students thinking about measuring likelihood? What scale can we do it in? Examples: Probability of dead or alive; probability of being a male or female. Probability of being dead and alive at the same time; probability of flipping a coin and a bunny hop out of it; probability of... Offer us some less outlandish questions, though illustrative of definitions of probability.

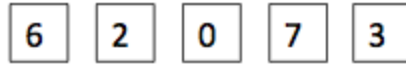
P2 What are some nice intro questions we can ask? What activities can we perform? Are cards too abstract? Probability of drawing a type of card from a deck? Progression into 2 cards with replacement (what are these events called), and then without (what are these called?).

P3 Will this work? Other ideas? Blends probability and data handling but we could poll those with families of 2 or greater. Record the frequency of BB, BG, GB, and GG and compare that to our theoretical model. What other projects can we do to explore relative frequency v probability concepts?

P4 Would these ideas work? How can we adjust them? Given two, then three, then four colored cards, have students play around with 2-colored flags and different arrangements, where order matters--recording their flags in colors. This could be a way to introduce counting principles. Then four cards with numbers--as in problem below from exemplar--recording their numbers in least to greatest again where order matters. Then maybe asking them questions about the data. Mean, Median, Mode, etc.

P5 *from exemplar*

29. Phiti has five numbered cards. How many different two-digit numbers can she make with these five cards?



--let's give students cards to play with and record--as above

P6 from 2012 exemplar

27. Study the picture below.

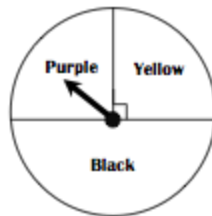


A bag contains black and white marbles. The probability of taking a white marble out of the bag above, without looking in the bag, is _____.

--pretty simple problems but let's make sure they're prepared for these.

P7 from a 2013 grade 9 exemplar

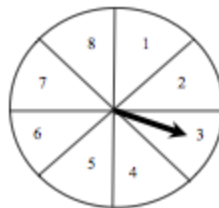
- 7.2 The spinner below is spun twice in succession.



- 7.2.1 What is the probability that the arrow will point to yellow after the first spin and to black after the second spin?

QUESTION 8

8. If the spinner below is rotated, determine the probability that the arrow will point to:



- 8.1 An even number?
8.2 A number greater than 2?
8.3 A factor of 8.

P8 Questions relating to data handling and probability: distribution of rolling dice..... If a 6-sided die is rolled, what is the probability of rolling a 2? An odd number? A factor of 6? What is the probability of rolling a 1 and then another 1?

What is the probability of rolling once, and the outcome being a 1 or a 6?

Debrief

Possible suggested lab--demonstration type lessons (activities all detailed in supplement)

1. Introduction. Sliding scale probability intuitive sense of probability as a sliding scale: ask them probability that they'll eat something green tonight; encounter a bicycle on the way home; get sent to the principal later today; get pooped on by a bird; etc. They can even imagine their own events and trade questions with each other.
2. What's in the bag? Pieces of paper in a bag (or colored squares: use first for Pythagorean theorem)--deducing ratios in the bag from class data...relative frequency v. probability, observed v. expected; hit lots of branches with this 2-in-1 lab: scientific method; geometry; data handling; probability.
3. Game. 2 coin toss and have three parts of the room; 1 representing the HH team. the other the TT team and the other representing a tail and a head. Tally--first to 20 wins. QUESTION: does the procedure of coin toss affect outcome and results? What does this tell us about the nature of these two events?
4. Perform experiments with tossing a coin, rolling a die, spinners. It's neat to work at this level because we might not have to codify the rules for them yet.

Probability--dependent and independent events

0. Brainstorm and exchange

I. Everyday terms, meaning of independent and dependent

- A) give examples of independent and dependent events
- B) If the occurrence of one event affects the probability of the other event...
- C) Note: if we replace, we consider the selections a case of _____ events
If we do not replace, we consider the selections a case of _____ events.

II. Multiplication rule is what we apply in cases of independent and dependent events.

- A) Relevant as we're talking about a sequence of separate events in trials
 1. easy if they are independent
 2. adjust accordingly if they are dependent
- B) underscores that "and" in context of probability implies what operation

P0 before we discuss probability, let's discuss how we conceive of probability.... Sliding scale probability intuitive sense of probability as a sliding scale--ask them probability that they'll eat something green tonight; encounter a bicycle on the way home; get sent to the principal later today; get pooped on by a bird; etc. They can even imagine their own events and trade questions with each other.

--we also need to define or remind our learners of the definition of how to calculate probability.

P1 What is the probability that the first child born will be a girl; and the second will also be a girl? Are these independent or dependent events.

--how can we represent this using a visual aid to justify the multiplication rule?

P2 What is the probability of guessing on a true and false question first, and a multiple choice question next (with choices a] through e]); and getting the first answer *and* second answer both correct?

--Are these independent or dependent events?

P3 Let's say we have only 4 geometric figures made of plastic to choose from. A sphere, a pyramid, a cube, and a cylinder. Without replacement, what is the probability of me randomly selecting a cube followed by a pyramid? Without replacement, what is the probability of me randomly selecting a pyramid, followed by another pyramid?

--Now with replacement, what is the probability of me randomly selecting a pyramid, followed by another pyramid? (Is this last selection an example of independent or dependent events?)

P4 For the following questions, determine first whether events A and B are independent or dependent; then, find $P(A \text{ and } B)$, meaning the probability that events A and B both occur in that particular order. (this exercise reinforces the different types of events, and how the probability is calculated)

A: When a baby is born, it is a girl.

B: When a single die is rolled, the outcome is a 6.

...

A: When you have two numbered balls to choose from, one with 20 and the other with 50; one selects 50 first and does not replace it.

B: Then one selects a 20.

...

A: When you have two numbered balls to choose from, one with 20 and the other with 50; one selects 50 first and then puts it back in the bag.

B: Then one selects a 20.

...

A: When a month is randomly selected from a calendar, then ripped out and destroyed, it is July.

B: When a different month is randomly selected from this same calendar, then ripped out and destroyed, it is November.

...

A: When the first digit (0-9) of a four-digit lottery number is guessed at by someone buying a ticket, it is the same first digit that is later drawn in the official lottery.

B: When the second digit of a four-digit lottery number is guessed at by someone buying a ticket, it is the same second digit that is later drawn in the official lottery.

P5 Let's say I know that if I pour boiling hot water into any mug, then the probability that a mug will break is 80%. What is the probability of pouring boiling water into two mugs, and having them both break? What is the probability of pouring boiling water into two mugs, and having them both survive?

P6 A battery-powered alarm clock works properly 90% of the time when set by an average person. If I set 3 alarms, what is the probability that they will all work properly? What is the probability that they will all fail? What is the description of the complement of all 3 alarms failing?

NAME _____
INTERACTIVE ALG/GEOM II

Probability

Be Sure to Show ALL Your Work!!!

Special Note: Reduce all fractions to lowest terms.

1. A card is chosen at random from a deck of 52 cards. It is then *replaced* and a second card is chosen. What is the probability of choosing a Jack first and a 3 second?
2. What is the probability that from a normal 52 card deck, you randomly draw a 3, and then *without replacing* the 3, you draw the Queen of Hearts?
3. A jar contains 6 red balls, 3 green balls, 5 white balls and 7 yellow balls. Two balls are chosen from the jar, with replacement. What is the probability that both balls chosen are green?
4. A box contains a penny, a nickel, and a dime. Find the probability of choosing a dime first and then, without replacing the dime, choosing a penny.
5. A coin is tossed and a single 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling 3 on the die.
6. The teacher of a class that contains 12 boys and 16 girls needs to pick two volunteers. She randomly selects one student, and then selects another student from the class. Find the probability that
 - a. she chooses a girl first, then a boy
 - b. she chooses two boys

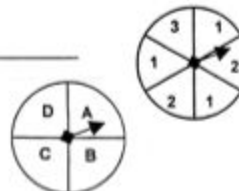
Probability with Compound Events (Independent and Dependent) **Practice**

Describe the events by writing **I** for *independent event* or **D** for *dependent event*.

- Ann draws a colored toothpick from a jar. Without replacing it, she draws a second toothpick. _____
- John rolls a six on a number cube and then flips a coin that comes up heads. _____
- Susie draws a card from a deck of cards and replaces it. She then draws a second card. _____
- Seth draws a colored tile from a bag, replaces it; draws a second tile from the bag, replaces it; and then draws a tile a third time from the bag. _____
- You draw a red marble from a bag, and then another red marble (without replacing the first marble)? _____

Using the two spinners, find each **compound** probability.

- $P(A \text{ and } 2)$ _____
- $P(D \text{ and } 1)$ _____
- $P(B \text{ and } 3)$ _____
- $P(A \text{ and not } 2)$ _____



A box contains 3 red marbles, 6 blue marbles, and 1 white marble. The marbles are selected at random, one at a time, and are **not replaced**. Find each **compound** probability.

- $P(\text{blue and red})$ _____
- $P(\text{blue and blue})$ _____
- $P(\text{red and white and blue})$ _____
- $P(\text{red and red and red})$ _____
- $P(\text{white and red and white})$ _____

Suppose that two tiles are drawn from the collection shown at the right. The first tile is replaced before the second is drawn. Find each **compound** probability.



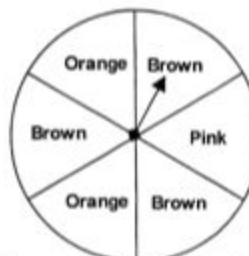
- $P(A \text{ and } A)$ _____
- $P(R \text{ and } C)$ _____
- $P(A \text{ and not } R)$ _____

Suppose that two tiles are drawn from the same collection shown above. The first tile is **not** replaced before the second is drawn. Find each **compound** probability.

- $P(A \text{ and } A)$ _____
- $P(R \text{ and } C)$ _____
- $P(A \text{ and not } R)$ _____

Use the spinner to the right for the next two problems.

- If you spin the spinner twice, what is the probability of spinning orange then brown? _____
- If you spin the spinner twice, what is the probability of spinning brown both times? _____



- Kevin had 6 nickels and 4 dimes in his pocket. If he took out one coin and then a second coin without replacing the first coin ---
 - what is the probability that both coins were nickels? _____
 - what is the probability that both coins were dimes? _____
 - what is the probability that the first coin was a nickel and the second a dime? _____

ANSWERS

Probability with Compound Events (Independent and Dependent) Practice

1. D 2. I 3. I 4. I 5. D

6. $\frac{1}{2} \times \frac{2}{6} = \frac{1}{12}$

7. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

8. $\frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$

9. $\frac{1}{4} \times \frac{2}{3} = \frac{1}{6}$

10. $\frac{6}{10} \times \frac{2}{9} = \frac{1}{5}$

11. $\frac{6}{10} \times \frac{2}{9} = \frac{1}{5}$

12. $\frac{3}{10} \times \frac{1}{9} \times \frac{6}{8} = \frac{1}{40}$

13. $\frac{3}{10} \times \frac{2}{9} \times \frac{1}{8} = \frac{1}{120}$

14. $\frac{1}{10} \times \frac{3}{9} \times \frac{6}{8} = \frac{1}{40}$

15. $\frac{2}{15} \times \frac{2}{15} = \frac{4}{225}$

16. $\frac{6}{15} \times \frac{3}{15} = \frac{2}{25}$

17. $\frac{2}{15} \times \frac{9}{15} = \frac{2}{25}$

18. $\frac{2}{15} \times \frac{1}{14} = \frac{1}{105}$

19. $\frac{6}{15} \times \frac{3}{14} = \frac{3}{35}$

20. $\frac{2}{15} \times \frac{8}{14} = \frac{8}{105}$ (because A also now removed)

21. $\frac{2}{6} \times \frac{3}{6} = \frac{1}{6}$

22. $\frac{3}{6} \times \frac{3}{6} = \frac{1}{4}$

23. (a) $\frac{6}{10} \times \frac{5}{9} = \frac{1}{3}$

(b) $\frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$

(c) $\frac{6}{10} \times \frac{4}{9} = \frac{4}{15}$


Practice Probability with Compound Events

2


144 Probability

Talk about these pictures.
Probability is how likely something is to happen.

Unlikely to happen



Likely to happen



1. Answer: Likely or unlikely to happen

- I will drive a car one day. _____
- I can stay awake for 4 days. _____
- I will play with my dog this afternoon. _____
- I will buy a house tomorrow. _____
- I will go to Europe this holiday. _____
- I will sit down today. _____
- The sun will shine next week. _____
- This summer it will snow. _____
- I will listen to music today. _____
- I will go to bed tonight. _____


2. Write the answer under the correct heading.

go to sleep	take a shower	move to England	eat breakfast
play in the pool	win the Lotto	play with friends	play soccer

Something that will **likely** happen to you today.

Something that will not **likely** happen to you today.

3. Use the cut-out die or make your own.



- What colour do you like the most on the die? _____
- What colour do you like the least on the die? _____
- Ask your friend the same questions. What did she or he answer? _____

- Roll the die. On what colour did it land? _____
- Ask your friend to roll the die. On what colour did it land? _____
- Did you land on the same colour? _____
- Did the other children in your class land on the same colour? _____

4. Role the die 30 times and record your results in the table below, using tallies.

red	yellow	green	orange	blue	brown

5. What will happen if you use two dice? What is the probability of rolling a:

1?	2?	3?	4?	5?	6?

Ask your family

Ask your family to help you to complete the diagram below.

↑

Likely to happen

↑

Unlikely to happen

<http://www.math-aids.com/Probability/>

http://www.math-aids.com/cgi/pdf_viewer_8.cgi?script_name=probability_definition.pl&x=144&y=29

Definitions for Probability

Probability

Probability is the likelihood of the occurrence of an event. The probability of event A is written $P(A)$. Probabilities are always numbers between 0 and 1, inclusive.

The four basic rules of probability:

- 1) For any event A, $0 \leq P(A) \leq 1$.
- 2) $P(\text{impossible event}) = 0$.
Also written $P(\text{empty set}) = 0$ or $P(\emptyset) = 0$.
- 3) $P(\text{sure event}) = 1$.
Also written $P(S) = 1$, where S is the sample set.
- 4) $P(\text{not } A) = 1 - P(A)$.
Also written $P(\text{complement of } A) = 1 - P(A)$ or $P(A^c) = 1 - P(A)$ or $P(\bar{A}) = 1 - P(A)$.

Probability : Independent Events

Independent Events

Independent Events are not affected by previous Events.

A coin does not "know" it came up heads before ...



... each toss of a coin is a perfect isolated event.

When rolling a pair of dice, one die does not affect the outcome of the other die ...



... each die is an isolated event.

$$\text{Probability of an event happening} = \frac{\text{Number of ways it can happen}}{\text{Total number of outcomes}}$$

Probability of getting a "Head" when tossing a coin?

$$P(\text{Head}) = \frac{\text{"Head"}}{\text{"Head and Tail"}} = \frac{1}{2}$$

Probability of rolling a "4" on a die?

$$P(4) = \frac{\text{"4"}}{\text{"1", "2", "3", "4", "5", "6"}} = \frac{1}{6}$$

Probability : Independent Events

Two or More Events

You can calculate the probability of two or more Events by multiplying the individual probabilities.

So, for Independent Events:

$$P(A \text{ and } B) = P(A) \times P(B)$$

Example: Probability of 3 Heads in a Row

For each toss of a coin a "Head" has a probability of 0.5 :



0.5



$$0.5 \times 0.5 = 0.25$$



$$0.5 \times 0.5 \times 0.5 = 0.125$$

So the Probability of getting three Heads in a Row is 0.125.

Conditional Probability : Dependent Events

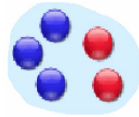
Dependent Events

Dependent Events are affected by previous events.

Example: Marbles in a Bag

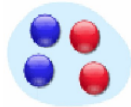
There are 3 blue and 2 red marbles in a bag.

What is the probability of drawing a blue marble on the first and second draw?



$$P(\text{Blue 1st Draw}) = \frac{3}{5}$$

after the first draw you have changed the chances for the next draw



$$P(\text{Blue 2nd Draw}) = \frac{2}{4} = \frac{1}{2}$$

The probability of

$$P(\text{Blue 1st Draw and Blue 2nd Draw}) = P(\text{Blue 1st Draw}) \times P(\text{Blue 2nd Draw})$$

$$P(\text{Blue 1st Draw and Blue 2nd Draw}) = \frac{3}{5} \times \frac{1}{2}$$

$$P(\text{Blue 1st Draw and Blue 2nd Draw}) = \frac{3}{10}$$

Replacement

Note: if you had replaced the marbles in the bag each time, then the chances would not have changed and the events would be independent:

- With Replacement: the Events are Independent (the chances don't change)
- Without Replacement: the Events are Dependent (the chances change)

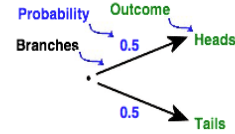
Probability Tree Diagrams

Calculating probability is confusing at times, especially for multiple events.

Tree diagrams give you a visual and more simple way to solve complex probability problems.

The diagrams are composed of three items: Branches, Probabilities, and Outcomes.

Example: Probability of tossing a coin.



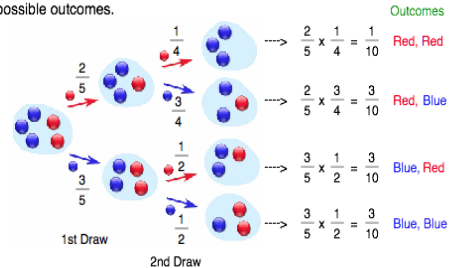
There are two Branches (Heads and Tails)

- The probability for each Branch is written on the Branch (0.5)
- The Outcome is written at the end of the Branch.

Now let us graph the previous example of the 3 blue and 2 red marbles in a bag.

What is the probability of drawing two red marbles from the bag with no replacements?

Graph out all possible outcomes.



You may find the probability of any outcome by multiplying the probabilities along any path.

http://www.gscdn.org/library/cms/24/25324.pdf?_ga=1.103851395.226993679.1463690423

http://www.gscdn.org/library/cms/22/24922.pdf?_ga=1.175702433.226993679.1463690423<http://www.commoncoresheets.com/Math/Probability/Basic%20Probability/English/3.pdf>

<http://www.mathworksheets4kids.com/probability/balls-container.pdf>

Probability scale 0 to 1

Look at this probability line.

Impossible = 0
 Poor chance = 0.25
 Fair = 0.5
 Good chance = 0.75
 Certain = 1

Write each letter in the correct place on the probability line.

a. It will be daylight in New Orleans at midnight.
 b. The sun will come up tomorrow.
 c. If I toss a coin it will come down heads.

0 0.25 0.5 0.75 1

Write each letter in the correct place on the probability line.

a. If I cut a pack of cards I will get a red card.
 b. If I cut a pack of cards I will get a diamond.
 c. If I cut a pack of cards I will get a diamond, a spade, or a club.
 d. If I cut a pack of cards I will get a diamond, a spade, a club, or a heart.
 e. If I cut a pack of cards it will be a 15.

0 0.25 0.5 0.75 1

Write each letter in the correct place on the probability line.

a. Next week, Wednesday will be the day after Tuesday.
 b. There will be 33 days in February next year.
 c. It will snow in Miami in May.
 d. It will snow in Chicago in January.
 e. The next person to knock on the door will be a woman.

0 0.25 0.5 0.75 1

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SCHOOLS

Probability

Mark each event on the probability line.

a) It will get dark tonight.
 b) When I toss a coin, it will land showing heads.
 c) Abraham Lincoln will come for lunch.

impossible poor chance even chance good chance certain

Mark each event on the probability line.

a) Snow will fall in August.
 b) The sun will come up tomorrow.
 c) A new baby will be a boy.
 d) A dog will speak English.
 e) I will watch some television tonight.

impossible poor chance even chance good chance certain

Mark each event on the probability line.

a) I will roll a 6 on a number cube.
 b) I will not roll a 6 on a number cube.
 c) I will roll a number between 1 and 6 on a number cube.
 d) I will roll a 7 on a number cube.
 e) I will roll a 1, a 2, or a 3 on a number cube.

impossible poor chance even chance good chance certain

Mark each event on the probability line.

a) I will drink something today.
 b) If I drop my book, it will fall face down.
 c) The next book I read will have exactly 100 pages.
 d) It will rain orange juice tomorrow.
 e) I will see a white car today.

impossible poor chance even chance good chance certain

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SCHOOLS

Basic Probability

Name: _____

Use each diagram to solve the problems.

1) How many pieces are there total in the spinner?

2) If you spun the spinner 1 time, what is the probability it would land on a gray piece?

3) If you spun the spinner 1 time, what is the probability it would land on a black piece?

4) If you spun the spinner 1 time, what is the probability it would land on a white piece?

5) If you spun the spinner 1 time, what is the probability of landing on either a gray piece or a white piece?

6) If you were to roll the dice one time what is the probability it will land on a 4?

7) If you were to roll the dice one time what is the probability it will NOT land on a 4?

8) If you were to roll the dice one time, what is the probability of it landing on an odd number?

9) How many shapes are there total in the array?

10) If you were to select 1 shape at random from the array, what is the probability it will be a diamond?

11) If you were to select 1 shape at random from the array, what shape do you have the greatest probability of selecting?

12) Which shape has a 35% chance (7 out of 20) of being selected?

Answers

1. 8
2. 0
3. 0.5
4. 0.5
5. 1
6. 1/6
7. 5/6
8. 5/6
9. 12
10. 1/3
11. Circle
12. Circle

Balls in a container

Work Space

There are 5 white balls, 8 red balls, 7 yellow balls and 4 green balls in a container. A ball is chosen at random.

What is the probability of choosing red?

Answer:

What is the probability of choosing green?

Answer:

What is the probability of choosing either red or white?

Answer:

What is the probability of choosing neither white nor green?

Answer:

What is the probability of choosing other than yellow?

Answer:

What is the probability of choosing black?

Answer:

NUMBERS, OPERATIONS, & RELATIONSHIPS

THE REAL NUMBER LINE

- A. Indicate the approximate position on the real number line for each of the following numbers: 2.1 , $4/3$, $\sqrt{17}$, -0.8 , π , $2/5$, $-22/7$.



- B. Between which two consecutive integers is the number $\sqrt{57}$?

Between which two consecutive integers is the number $\sqrt{29}$?

Compare. Use $<$, $>$, or $=$.

1. $-\frac{2}{9}$ $-\frac{4}{9}$

2. $-\frac{1}{6}$ $-\frac{2}{3}$

3. $-\frac{5}{12}$ $-\frac{3}{4}$

4. -1.2 -2.1

5. -0.6 -0.52

6. -1.23 -1.25

7. -5.3 $-5.\bar{3}$

8. $-3\frac{1}{4}$ -3.25

9. $-4\frac{2}{5}$ -4.12

Order from least to greatest.

10. $\frac{5}{4}$, 1.5 , $-\frac{3}{2}$, -0.5

11. $\frac{1}{11}$, -0.9 , 0.069 , $\frac{1}{10}$

12. 0.12 , $-\frac{11}{12}$, $-\frac{1}{6}$, -0.1

13. $\frac{2}{3}$, 0.6 , $-\frac{5}{6}$, -6.6

14. 1.312 , $1\frac{3}{8}$, $-1\frac{3}{10}$, -1.33

15. $1\frac{4}{5}$, $-\frac{8}{9}$, -1

Evaluate. Write in simplest form.

16. $\frac{y}{z}$, for $y = -6$ and $z = -20$

17. $\frac{2y}{-z}$, for $y = -5$ and $z = -12$

18. $\frac{y+z}{2z}$, for $y = -4$ and $z = 8$

19. $\frac{-2y+1}{-z}$, for $y = 3$ and $z = 10$

Compare.

20. The temperature at 3:00 A.M. was -17.3°F . By noon the temperature was -17.8°F . At what time was it the coldest?
-

21. Samuel is $\frac{5}{8}$ in. taller than Jackie. Shelly is 0.7 in. taller than Jackie. Who is the tallest?
-

Find each sum.

1. $2.5 + (-7.9)$

2. $-2.92 + (-1.25)$

3. $-12.1 + 4.8$

4. $-\frac{3}{8} + \frac{1}{2}$

5. $-1\frac{1}{5} + (-\frac{1}{2})$

6. $-6\frac{1}{8} + 1\frac{1}{4}$

7. $20\frac{5}{16} + (-12\frac{1}{4})$

8. $-100.04 + (-4.01)$

9. $-8.33 + 7.17$

Find each difference.

10. $3.7 - (-12.4)$

11. $-5.55 - (-1.25)$

12. $-14.6 - 6.4$

13. $\frac{5}{12} - \frac{1}{2}$

14. $2\frac{5}{8} - 2\frac{1}{4}$

15. $-4\frac{1}{4} - (-\frac{1}{2})$

16. $90\frac{7}{16} - (-12\frac{1}{4})$

17. $-5.04 - (-12.08)$

18. $-10.65 - 20.75$

19. What is the difference between -30.7 and -8.5 ?
_____20. The melting point of sodium is 208°F . The melting point of mercury is -37.7°F . What is the difference in melting points of these two elements?

Find each product. Write your answers in simplest form.

1. $2\frac{3}{4} \cdot 1\frac{1}{2}$

2. $-\frac{3}{5} \cdot \frac{7}{9}$

3. $(1\frac{7}{8})(-\frac{3}{5})$

4. $(-\frac{4}{5})(-2\frac{3}{4})$

5. $2\frac{1}{3} \cdot (-\frac{1}{5})$

6. $(-4\frac{1}{3})(\frac{5}{6})$

7. $(\frac{3}{8})(2\frac{1}{9})$

8. $-1\frac{1}{5} \cdot (\frac{1}{2})$

9. $(1\frac{1}{4})(1\frac{3}{4})$

Find each product.

10. $-1.3 \cdot (-4.8)$

11. $(12.5)(-0.2)$

12. $(4.9)(3.4)$

13. $-3.7(5.4)$

14. $-6.5 \cdot (3.5)$

15. $(8.7)(-2.1)$

16. $(-7.1)(-1.7)$

17. $9.3 \cdot (6.3)$

18. $(-10.06)(-6)$

19. Maggie went on a hot air balloon ride. At its highest altitude, the balloon was at 1,500 feet, but Maggie's ride was at $\frac{1}{3}$ of that altitude most of the time. What was the altitude for most of Maggie's ride?

20. An open parachute can descend $7\frac{3}{4}$ yards in one second. At that rate, what number represents the direction and distance it descends in 6 seconds?

Find each quotient. Write your answers in simplest form.

1. $-4\frac{1}{2} \div \frac{1}{4}$

2. $1\frac{9}{10} \div (-\frac{5}{8})$

3. $1\frac{1}{8} \div 2\frac{1}{2}$

4. $6\frac{1}{3} \div \frac{2}{3}$

5. $(-\frac{3}{5}) \div (-1\frac{1}{3})$

6. $\frac{9}{10} \div (-\frac{3}{4})$

7. $(-\frac{5}{8}) \div (-\frac{3}{4})$

8. $-3\frac{1}{4} \div 1\frac{1}{2}$

9. $(-2\frac{1}{5}) \div 10$

Find each quotient.

10. $-73.1 \div 4.3$

11. $2.73 \div (-0.7)$

12. $(-8.75) \div (-2.5)$

13. $4.44 \div (-3.7)$

14. $0.072 \div 0.08$

15. $-76.44 \div 9.1$

16. $(-0.115) \div (-0.23)$

17. $5.94 \div -11$

18. $(-0.802) \div (-4.01)$

19. Zain owes \$1,312.50 for a new computer. An equal amount will be taken from his bank account each month for $10\frac{1}{2}$ months. How much will be taken out each month?

20. A marine biologist is measuring the temperature of a lake at 6 equally spaced depths. She makes her measurements at a point where the lake is 33.6 feet deep. What signed number represents the distance and direction of the first measurement from the lake's surface?

Grade 7: Problems in Context

Concepts of Fractions

The following is from Dr. Neil Pateman, University of Hawaii, with much thanks. (EDCI 324/325 Elementary Math Methods I and II)

It must be understood that it is insufficient to expect that the knowledge children have about whole number, often very detailed and secure knowledge, will “transfer across” to the realm of fractions. In particular, the idea that because children seem to have mastered the idea of operations on whole numbers, it will be a simple matter to introduce fraction operations, is based on a false assumption. It must be remembered that a fraction symbolizes something very different from a whole number, and that the operations on fractions correspond to different actions on objects that is the case for whole number operations.

Even more than with whole numbers, there is a tendency in the elementary school to quickly concentrate on symbolic manipulation for its own sake, with insufficient attention given to the underlying concepts of fractions. For example, many students in teacher education know the rules for operating on fractions, but very few can give any reason for why the rules work.

From the NAEP Fourth Mathematics Assessment:

“Many students appear to have learned fraction computations as procedures without developing the underlying conceptual knowledge about fractions”

A fraction quantifies a portion (part of a whole). So, for example, the fraction three-quarters is the name for the portion I form by taking some whole, splitting it into exactly four equal-sized parts, and considering three of those parts:



Three of four parts of this whole are shaded. We write $\frac{3}{4}$.

Every fraction may be thought of in this way, as a set of directions for the creation of the portion that the fraction names. This should be the case even if I do not intend to create the portion. (Note that the word “fraction” itself comes from the Latin “frangere” - “to break”).

A fractional number enumerates, which means provides a number for, some portion of a whole. Sometimes that portion will be one or more wholes together with part of another whole, so that it is possible to think of “two and a half” as a portion. It is important to make the distinction that the portion has real, or potentially-real existence, whereas the fractional number is an abstraction we create in our minds to enumerate that portion.

Being asked to “Bring 5 red blocks out of the box” requires the child to count out five of those things in the box that the child decides are red blocks. The nature of the other things in the box does not matter, nor does the size of the blocks, just as long as they are red. There is no need to count how many things are in the box altogether. Asked to “Get two-fifths of the chocolate in the box” calls for a different set of actions and underlying concepts to be brought into play. All of the chocolate in the box would need to be measured somehow, and then broken into five equal-sized parts, with two of those parts presented in response to the task. . The actions called for are quite different!

The underlying idea of a fraction as a position on a number line is perhaps too abstract as an introduction. There is considerable evidence that the use of a circle as a beginning model of a whole for young children is most inappropriate. A continuous model for portions, e.g. an area model, is better for children to start with, in comparison with a discrete model, such as a set of objects.

Fraction Activities

I. Concepts

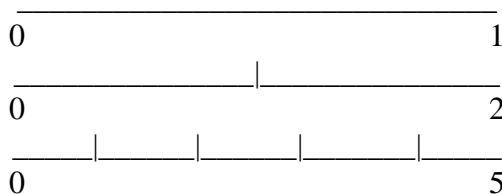
1. Collect some identical rectangles of paper. Use paper folding to create separate models for halves, thirds, fourths, fifths, sixths, sevenths and eighths. Make all folds in the same direction. Did you develop any techniques for your paper folding? Were there any which were “easier” to fold than the others? Why? Consider fractions with denominators from 2 to 32; how would you categorize them in terms of easiness to fold? (No, don’t fold them!) Do the number of folds have anything to do with the number of parts in each case? Verbalize the relationship.

2. Use your pieces of paper to determine which is larger, $\frac{2}{3}$ or $\frac{3}{5}$. Which is larger, $\frac{3}{5}$ or $\frac{4}{7}$? (Compare the portions, do not calculate. Give a logical argument

(based on thinking about the portions) for which is larger; $\frac{1}{6}$ or $\frac{1}{7}$? $\frac{4}{5}$ or $\frac{5}{6}$?

- How would you use the sheets of paper folded as in 1 above to develop the idea of **equivalent fractions**?

3. On each of the following number lines, locate the position of the fraction $\frac{2}{3}$.



4. Try to create the portion for the fraction given in each example:



shade $\frac{3}{5}$



shade $\frac{2}{3}$

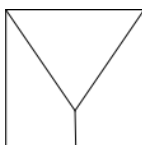
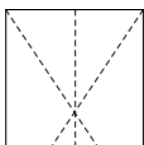


shade $\frac{5}{8}$



shade $\frac{3}{5}$

5. Look at the following square. Where exactly must the folds be placed so that all three shaded areas are all equal in size?? What fraction must each part be?



II. Operations

1. Addition with like denominators:
I have two-fifths meter of string and find another two-fifths meter. How much string do I have now?

Indicate the first $\frac{2}{5}$, the second $\frac{2}{5}$, and the result.

Now write the record of your actions:

2. Addition requiring equivalent fractions:
I have a bottle with one-half liter of milk. I pour one-third liter of milk into the bottle. How much milk is now in bottle? First shade the rectangle as you perform the actions. Mark it as needed.



3. a A length of $\frac{1}{4}$ meters is cut from a piece of timber which is $\frac{1}{2}$ meter long.
What length remains? Draw a picture.
- b A piece of string $\frac{4}{5}$ meters long has a piece $\frac{7}{10}$ meter cut off it. What length remains?
4. One-half meter of pipe is laid beside a two-thirds meter length. What is their difference? Draw a picture.
They are now laid end-to-end. What is the combined length? Draw a picture.
5. A child picks up one block weighing $\frac{3}{5}$ kg and another weighing $\frac{1}{2}$ kg. How much heavier is the first brick. Draw a picture. What mass is the child carrying? Draw a picture.

Week 2

6. A child buys $\frac{3}{5}$ kg of candy and eats half the candy. What weight was eaten?

Draw a picture of $\frac{3}{5}$. Perform an action to show taking one-half. Now record your actions.

7. Two-thirds of a $1\frac{1}{2}$ meter length of timber is used. What length is used? Draw and record.

8. A lawnmower tank holds $\frac{5}{6}$ liter of fuel. I have a can that holds $1\frac{1}{4}$ liter. How many tankfulls is this?

9. Problems

a A rectangle has an area of $\frac{1}{3}\text{cm}^2$. If its width is $\frac{3}{5}$ cm, what is the length

b Compute: $\frac{1}{3}$ divided by $\frac{3}{5}$.

10. Problems:

a Compute: $3\frac{1}{2} - 3\frac{1}{3}$.

b Compute: $3\frac{1}{3} - 2\frac{1}{2}$.

11. a When cutting $5\frac{1}{4}$ m rope into $\frac{3}{4}$ m ropes, how many $\frac{3}{4}$ m ropes can we obtain?

b When cutting $5\frac{1}{4}$ m rope into $\frac{1}{5}$ m ropes, how many $\frac{1}{5}$ m ropes can we obtain?

III. Problems and Applications

1.
 - a.) Write a fraction between $\frac{3}{10}$ and $\frac{5}{10}$.
 - b.) Write 3 fractions between $\frac{3}{10}$ and $\frac{5}{10}$.
 - c.) How many fractions are between any 2 fractions?
2.
 - a.) Write 2 fractions whose difference is $\frac{2}{13}$.
 - b.) Write 2 fractions whose difference is $\frac{2}{13}$, such that when each fraction is in lowest terms the denominators are different.
3. Write 2 fractions that multiply to give 6
4. Write $3\frac{1}{2}$ as a decimal. Is it 15.5 or is it 3.5?
9.
 - a.) Write 2 numbers whose average is 6.
 - b.) Write a different pair of numbers whose average is 6.
 - c.) Write 2 fractions whose average is 6.
10. A number cube (die) has the numbers 1 to 6 placed on the sides, one number per side. What is the probability that a rolled die will show the number 4?
11. If we gather all the families with 3 children, what is the probability that:
 - a.) all are girls?
 - b.) 2 are girls and 1 is a boy
 - c.) They are not all the same sex?
12.
 - a.) Thokozani can paint a room in 6 hours. How much of the room can he paint in one hour?
 - b.) Toto can paint a room in 6 hours. How much of the room can she paint in one hour?
 - c.) When Thokozani and Toto work together, how much of the room can they paint in one hour?
 - d.) In how many hours can Thokozani and Toto paint one room?
13. A man died with 17 horses, but his will said the eldest child gets $\frac{1}{2}$ of his property, the middle child gets $\frac{1}{3}$ and the youngest $\frac{1}{9}$. The lawyer rode in on his horse and said, "I'll loan you mine, then we have 18. The eldest got 9, the middle one got 6 and the youngest got 2, for a total of 17, and the lawyer took back his horse. What happened? Find other numbers for which this works.
14.
 - a.) When cutting $5\frac{1}{4}$ m rope into $\frac{3}{4}$ m ropes, how many $\frac{3}{4}$ m ropes can we obtain?
 - b.) When cutting $5\frac{1}{4}$ m rope into $\frac{1}{5}$ m ropes, how many $\frac{1}{5}$ m ropes can we obtain?

Financial Maths

1. Mr. Msebenzi buys 480 sweets for E50,00. He repacks the sweets into packets of 24 each.
 - (a) Would he have a profit if he sold all of the packets for E2? If not, what would his loss be if he had one?
 - (b) Would he have a profit if he sold all of the packets for E2,50? If not, what would his loss be if he had one?
 - (c) What would happen if he sells only 19 packets at E2,50?
2. Carton A of orange juice contains 24 ounces of orange concentrate and 40 ounces of water. Carton B contains 15 ounces of orange concentrate and 30 ounces of water. What percentage of each carton is orange concentrate? Which carton has a stronger orange flavor?
4. A store decided to raise the price of everything they had by 23%. If a shirt was originally priced at R100,00, by how much will the price increase? What will the new price of the shirt be?
5. Andrea has heard that prices in her grocery store are rising by 23%. She wants to purchase an item that used to cost R15,00.
 - (a) By how many rand did the cost of the item increase?
 - (b) How much will the item cost now?
 - (c) What percentage of R15,00 does the item now cost?
6. Sarah has a coupon for 25% off at the grocery store. Suppose she wants to purchase R750,00 worth of groceries
 - (a) How much will Sarah be saving?
 - (b) How much will Sarah spend total?
 - (c) What percentage of the full-price cost will Sarah pay?
7. Yunus has four items in his shopping basket with the following prices: R401,00, R324,00, R650,00, and R125,00. He also has a coupon for 40% off.
 - (a) How much will Yunus be saving?
 - (b) How much will Yunus spend total?
 - (c) What percentage of the full-price cost will Yunus pay?
8. Carl has four items in his shopping basket with the following prices: R75,25, R69,99, R38,92, and R24,25. He has a coupon for 10% off. What percentage of the full-price will Carl pay for his items? How much will Carl pay total?
9. Akila wants to buy a R100,00 football jersey and has a coupon for $r\%$ off. What percentage of the full-price will Akila pay for his jersey? How much will Akila pay? Express your answers in terms of r .

10. Now Akila wants to buy a jersey that costs P rand and he has a coupon for $r\%$ off. How much will Akila pay? Express your answers in terms of r and P .
16. Woolworth's had a going-out-of-business sale. The price of a telephone before the sale was R475,00. What was the price of the telephone after a 30% discount? If the sale price of the same telephone had been R285,00, what would the (percentage) discount have been?
17. Coffee beans lose 12.5% of their weight during roasting. In order to obtain 252 kg of roasted coffee beans, how many kg of unroasted beans must be used?
18. Last week, Chris bought a DVD for R128,00 while the store was having a 25% off sale. The sale is now over. How much would the same DVD cost today?
19. Last year, the price of an iPod was R2852,00.
- (a) This year the price increased to R3090,00. By what percent did the price increase?
- (b) If the price next year were 5% more than this year's price, what would that price be?
- (c) If the price dropped 5% the year after that, show that the price would not return to R3090,00. Explain this apparent paradox.
20. The population of a small town increased by 25% two years ago and then decreased by 25% last year. The population is now 4500 persons. What was the population before the two changes?
21. Corey deposits R3000,00 in a bank that pays 4% annual interest. How much interest does Corey earn in one year? How much money is in Corey's account after one year?
22. Corey deposits R3000,00 in a bank that pays 6% annual interest. How much interest does Corey earn in one year? How much money is in Corey's account after one year?
23. One year after Robin deposits R4000,00 in a savings account that pays $r\%$ annual interest, how much money is in the account? Write an expression using the variable r .
24. One year after Robin deposits P rand in a savings account that pays $r\%$ annual interest, how much money is in the account? Write an expression in terms of the variables P and r . If you can, write your answer using just a single P .

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