PROFICIENCY CHALLENGE 13 ANSWER KEY

AMV = “Answers May Vary”

1	a	The second card is more likely to be higher because five cards (1, 2, 3, 4, 5) are lower and still covered and only four cards (7, 8, 9, 10) are higher and still covered.
	b	The third card MUST be lower than 10. There’s 100% chance it will be since all the remaining options (1, 2, 3, 4, 5, 7, 8, 9) are less than 10.
	c	AMV. But Sevi is correct. The only numbers left (1, 2, 3, 4, 5, 7, 8) are all less than 9.
	d	The fourth card must be a 4 because that leaves the same number of numbers less than 4 (1, 2, 3) as there greater than 4 (5, 7, 8).

2	a	Claim 1 is inaccurate having two possible outcomes does not mean that each outcome has a 50% chance of happening. For example, you will die tomorrow or you won’t, but each of these two outcomes is not equally likely.
	b	Claim 2 is inaccurate. The gender of a child is an independent event in terms of probability. Having 5 girls in a row is a 1 in 32 chance, but that has nothing to do with the gender of the 6th child. For example, if you flipped a coin “heads” five times in a row, the 6th coin flip is still a 50/50 chance of being heads/tails. This is a common misconception in probability and is related to the concept of the “gambler’s fallacy”.
	c	Claim 3 is inaccurate. An outcome of 3, 4, 2, 1 in that order is just as likely (1 in 1,296) as rolling a 5, 5, 5, 5.

3	AMV. 22 out of 50 people is 44%. If that sample is an accurate reflection of the 40,000,000 people who see the trailer on TV then you can expect about 16,000,000 of those 40,000,000 people will see the movie. Other variables to consider might be that the sample size isn’t an accurate proportional representation of the general public. Furthermore, some folks may never see the trailer and still go see the movie and they are not accounted for in the sample.

PROFICIENCY CHALLENGE 13 ANSWER KEY (Continued)

4	a	AMV. This only one possible data set of many, many, many data sets: 1, 1, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 6, 6, 6, 6, 6, 6, 6, 7.
	b	Charlotte notices that the "left" whisker doesn't appear in the box and whisker plot. This is unusual in most contexts, but not impossible. For example, the following data set is one of many, many, many data sets that could show Charlotte that the box and whisker plot for data set B is possible: 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 6, 6, 6, 6, 6, 6, 9, 9, 9.
	c	In general, the IQR represents the range of the middle 50% of data. In this particular case the data in B is so skewed to the left that the IQR does not represent a good measure of spread. In the example shown in part "b" (one of many possible answers), about 85% of data values are equivalent to data values in the IQR.
	d	AMV. In fact, they will vary greatly and this particular question asks 7th graders for a very deep level of understanding of data distribution that is beyond grade level. One possible context could be: A teacher gives period A and period B a 10-question pre-assessment to see what students know in terms of understanding a particular math concept that is in the unit they are about to study. Period A data shows that most students have some understanding of some of the concepts but that some students (about 25% or more) are particularly weak and some remediation/intervention may be necessary. Period B shows that almost all students have some working prior understanding of the concept and that some (maybe even 25%) have a strong understanding of the concept and the teacher should prepare some enrichment activities for this class.

PROFICIENCY CHALLENGE 14 ANSWER KEY

AMV = “Answers May Vary”

1	AMV. The purpose of this question is to see if students can form an argument for their reasoning. In general, a 14 cm by 15 cm rectangle is “more square” because the sides differ by a smaller percentage than the sides in the 4 cm by 5 cm rectangle. In other word, the larger rectangle is more “squarish” because the sides are closer to being equal (proportionally speaking) even though they differ by only 1 cm. In other words, a 1,000,000 cm by 999,999 cm rectangle is almost a square. The sides only differ by 1 cm in length. Proportionally, however, this big rectangle is practically a square.

2	a	This is always true by definition. Examples and diagrams will vary.
	b	This is not always true. For example, a 50˚ and a 10˚ angle can be adjacent, but they are not complementary. Examples and diagrams will vary.
	c	This is never true. Explanations may vary. Vertical angles are formed by two intersecting lines. By this definition, the vertical angles cannot be adjacent because a different pair of vertical angles are also formed by the intersecting lines. This second pair of angles always prevents the original pair from being adjacent.
	d	This is always true. Explanations may vary.

3	AMV. In general, the more “square” a rectangle is, the more area it contains. One example of a quadrilateral with a large area is (0, 1), (2, 7), (3, 9) and (6, 8). This may or may not the largest area. Explore possible solutions with your students to come up with larger ones.

4	Working backwards, \$5400 is 75% of \$7200. \$7200 is 80% of \$9000. And \$9000 is 90% of \$10000. The original price was \$10000.

5	a	60 minutes in an hour times 24 hours a day times 365 day equals 525,600 minutes.
	b	525,600 minutes is equivalent to 31,536,000 seconds. 31,526,000 seconds in a year times 186,282 miles per second means that light travels about 5,874,589,152,000 miles in a year.
	c	8 minutes is 480 seconds. At a rate of 186,282 miles per second for 480 seconds, the distance light travels from the sun to the Earth is about 90,000,000 miles. In reality, this distance varies since the Earth’s orbit (and the orbit of all planets) is elliptical and not circular. In general, this distance of 90 million miles (or 150 million kilometers) is considered an “astronomical unit” or an “AU” and is useful to gauge distances between objects in our solar system.

PROFICIENCY CHALLENGE 15 ANSWER KEY

AMV = "Answers May Vary"

1	AMV. For example, $r = 3$ or $r = 3.1$ or $r = 2.948532$.

2	• The quotient remains unchanged because the equivalent nonzero integers have the same effect as multiplying by 1. • The quotient remains unchanged because both h and k are multiplied by a -1 and the resulting effect is the same as multiplying by 1. • The quotient is changed because the multiplicative identity is not preserved. • The quotient remains unchanged because the multiplicative identity (the big 1) is preserved.

3	AMW. Here are some examples: (-4, -4, -4, -4, -4, -2, -2, -2, -2, -2) (-7, -7, -6, -5, -4, -2, -1, 0, 1, 1) (-1000, -500, -234, -100, -10, 4, 100, 100, 200, 200)

4	4 : 5; 8 : 10; 12 : 15; 16 : 20

5	AMV. This problem doesn't technically ask students to find the volumes of each cylinder, but to make arguments and use reasoning about why they think one cylinder is larger than the other. The dimensions and calculations for volume are below. Dimensions and volume for the "tall and skinny" cylinder: $r = (8.5)/(2\pi) = 1.353\ldots$ inches $h = 11$ inches $V = \pi(1.353\ldots)^2(11) = 63.25\ldots$ cubic inches Dimensions and volume for the "short and squat" cylinder. $r = (11)/(2\pi) = 1.751\ldots$ inches $h = 8.5$ inches $V = \pi(1.751\ldots)^2(8.5) = 81.831\ldots$ cubic inches The "short and squat" cylinder is larger.

PROFICIENCY CHALLENGE 16 ANSWER KEY

AMV = “Answers May Vary”

1	AMV. 96 x 85 x 74 would be one example of a large volume and also a large surface area. The more cubic the shape, the larger the volume and surface area.

2	AMV.

3	$(\pi - 2)/2$ This problem is quite challenging and requires partitioning the square into parts. A complete and worked out solutions to this classic problem can be found on the internet.

4	The small is the best buy.

5	936 sticky notes. Students may argue that handles and other real-world issues make the answer slightly less than 936.