A.M.3: Error 1: Calculate the relative error in measuring square and cubic units, when there is an error in the linear measure

1 The groundskeeper is replacing the turf on a football field. His measurements of the field are 130 yards by 60 yards. The actual measurements are 120 yards by 54 yards. Which expression represents the relative error in the measurement?

1) $\frac{(130)(60) - (120)(54)}{(120)(54)}$

2) $\frac{(120)(54)}{(130)(60) - (120)(54)}$

3) $\frac{(130)(60) - (120)(54)}{(130)(60)}$

4) $\frac{(130)(60)}{(130)(60) - (120)(54)}$

2 Carrie bought new carpet for her living room. She calculated the area of the living room to be 174.2 square feet. The actual area was 149.6 square feet. What is the relative error of the area to the *nearest ten-thousandth*?

1) 0.1412
2) 0.1644
3) 1.8588
4) 2.1644

3 Corinne calculated the area of a paper plate to be 50.27 square inches. If the actual area of the plate is 55.42 square inches, what is the relative error in calculating the area, to the *nearest thousandth*?

1) 0.092
2) 0.093
3) 0.102
4) 0.103

4 Jack wants to replace the flooring in his rectangular kitchen. He calculates the area of the floor to be 12.8 square meters. The actual area of the floor is 13.5 square meters. What is the relative error in calculating the area of the floor, to the *nearest thousandth*?

1) 0.051
2) 0.052
3) 0.054
4) 0.055

5 Students calculated the area of a playing field to be 8,100 square feet. The actual area of the field is 7,678.5 square feet. Find the relative error in the area, to the *nearest thousandth*.

6 The actual dimensions of a rectangle are 2.6 cm by 6.9 cm. Andy measures the sides as 2.5 cm by 6.8 cm. In calculating the area, what is the relative error, to the *nearest thousandth*?

1) 0.055
2) 0.052
3) 0.022
4) 0.021

7 The dimensions of a rectangle are measured to be 12.2 inches by 11.8 inches. The actual dimensions are 12.3 inches by 11.9 inches. What is the relative error, to the *nearest ten-thousandth*, in calculating the area of the rectangle?

1) 0.0168
2) 0.0167
3) 0.0165
4) 0.0164

Name: _____

8 Linda measures her rectangular bedroom window for a new shade. The measurements she made are 36 inches by 42 inches. The actual measurements of the window are 36.5 inches and 42.5 inches. Determine the relative error in calculating the area. Express your answer as a decimal to the *nearest thousandth*.

9 Wendy measures the floor in her rectangular bedroom for new carpeting. Her measurements are 24 feet by 14 feet. The actual measurements are 24.2 feet by 14.1 feet. Determine the relative error in calculating the area of her bedroom. Express your answer as a decimal to the *nearest thousandth*.

10 Janis measures the dimensions of the floor in her rectangular classroom for a rug. Her measurements are 10.50 feet by 12.25 feet. The actual measurements of the floor are 10.75 feet by 12.50 feet. Determine the relative error in calculating the area, to the *nearest thousandth*.

11 Sophie measured a piece of paper to be 21.7 cm by 28.5 cm. The piece of paper is actually 21.6 cm by 28.4 cm. Determine the number of square centimeters in the area of the piece of paper using Sophie's measurements. Determine the number of square centimeters in the actual area of the piece of paper. Determine the relative error in calculating the area. Express your answer as a decimal to the *nearest thousandth*. Sophie does not think there is a significant amount of error. Do you agree or disagree? Justify your answer.

12 Sarah measures her rectangular bedroom window for a new shade. Her measurements are 36 inches by 42 inches. The actual measurements of the window are 36.5 inches and 42.5 inches. Using the measurements that Sarah took, determine the number of square inches in the area of the window. Determine the number of square inches in the actual area of the window. Determine the relative error in calculating the area. Express your answer as a decimal to the *nearest thousandth*.

13 The actual side of a square tile is 4 inches. The manufacturers allow a relative error of 0.025 in the area of a tile. Two machines are used to cut the tiles. Machine A produces a square tile with a length of 3.97 inches. Machine B produces a square tile with a length of 4.12 inches. Determine which machine produces a tile whose area falls within the allowed relative error.

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Answer Section

1 ANS: 1 REF: fall0723ia

2 ANS: 2

$$\left| \frac{149.6 - 174.2}{149.6} \right| \approx 0.1644$$

REF: 080926ia

3 ANS: 2

$$\left| \frac{55.42 - 50.27}{55.42} \right| \approx 0.093$$

REF: 081023ia

4 ANS: 2

$$\left| \frac{13.5 - 12.8}{13.5} \right| \approx 0.093$$

REF: 081123ia

5 ANS:

$$\frac{8100 - 7678.5}{7678.5} \approx 0.055$$

REF: 061233ia

6 ANS: 2

$$\left| \frac{(2.6 \times 6.9) - (2.5 \times 6.8)}{(2.6 \times 6.9)} \right| \approx 0.052$$

REF: 011209ia

7 ANS: 3

$$\frac{(12.3 \times 11.9) - (12.2 \times 11.8)}{12.3 \times 11.9} \approx 0.0165$$

REF: 061120ia

8 ANS:

$$\left| \frac{(36.5 \times 42.5) - (36 \times 42)}{(36.5 \times 42.5)} \right| = \frac{39.25}{1551.25} \approx 0.025$$

REF: 061535ia

9 ANS:

$$\left| \frac{(24.2 \times 14.1) - (24 \times 14)}{(24.2 \times 14.1)} \right| = \frac{5.22}{341.22} \approx 0.015$$

REF: 011336ia

10 ANS:

$\dfrac{(10.75)(12.5)-(10.5)(12.25)}{(10.75)(12.5)} \approx 0.043$

REF: 081336ia

11 ANS:

618.45, 613.44, 0.008. $21.7 \times 28.5 = 618.45$. $21.6 \times 28.4 = 613.44$. $\left|\dfrac{618.45-613.44}{613.44}\right| \approx 0.008$. An error of less than 1% would seem to be insignificant.

REF: 060838ia

12 ANS:

1,512, 1,551.25, 0.025. $36 \times 42 = 1512$. $36.5 \times 42.5 = 1551.25$. $RE = \left|\dfrac{1512-1551.25}{1551.25}\right| \approx 0.025$.

REF: 010934ia

13 ANS:

Machine *A*. $A: \dfrac{4^2-3.97^2}{4^2} \approx .0149$ $B: \dfrac{4.12^2-4^2}{4^2} \approx .0609$

REF: 081438ia