Name: _____

Class: _____

Due Date: _____

Physics Topic 1E Math – Uncertainties

Add, subtract, multiply, and divide uncertainties. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. 3.14 ± 0.15
$+ \quad 9.26 \pm 0.53$

2. 6.26 ± 0.43
$+ \quad 30.8 \pm 0.24$

3. 10.69 ± 0.009
$+ \quad 9.37 \pm 0.004$

4. $\begin{array}{rl} & 5.89 \pm 0.79 \\ - & 3.23 \pm 0.84 \end{array}$

5. $\begin{array}{r} 9.544 \pm 0.28 \\ - \quad 8.4 \pm 0.97 \end{array}$

6. $\begin{array}{r} 5.829 \pm 0.09 \\ - \quad 4.94 \pm 0.455 \end{array}$

7. 3.14 ± 0.15
$\times \quad 9.26 \pm 0.53$

8. $\begin{array}{rl} & 6.26 \pm 0.43 \\ \times & 3.8 \ \pm 0.27 \end{array}$

9. 1.69 ± 0.39
$\times \quad 9.37 \pm 0.51$

10. 5.89 ± 0.79
$\div \quad 3.23 \pm 0.84$

11. $\begin{array}{rl} & 9.50 \pm 0.28 \\ \div & 8.4 \ \pm 0.97 \end{array}$

12. $\begin{array}{rl} & 5.82 \pm 0.09 \\ \div & 4.94 \pm 0.45 \end{array}$

13. $(3.14 \pm 0.15)^2$

14. $(9.26 \pm 0.53)^3$

15. $(6.26 \pm 0.43)^4$

16. $\sqrt{(3.14 \pm 0.15)}$

17. $\sqrt[3]{(9.26 \pm 0.53)}$

18. $\sqrt[4]{(6.26 \pm 0.43)}$

19. What is the percent uncertainty of the perimeter of a rectangle if has a length of (2.45 ± 0.3) m and a width of (3.56 ± 0.4) m?

20. What is the percent uncertainty of the area of a rectangle if its length is uncertain by 3% and its width is uncertain by 4%?

21. What is the percent uncertainty of the volume of a box if its length is uncertain by 3%, its width is uncertain by 4%, and its height is uncertain by 5%?

22. What is the percent uncertainty of the perimeter/circumference of a circle if its radius is uncertain by 7%?

23. What is the percent uncertainty of the area of a circle if its radius is uncertain by 7%?

24. What is the percent uncertainty of the volume of a sphere if its radius is uncertain by 7%?

25. Mustafa has a height of (172 ± 0.2) cm. Nour has a height of (167 ± 0.35) cm. How much taller, including uncertainty, is Mustafa taller than Nour?

26. Twelve identical square tiles each have a length of $45.62\ \text{cm}$ with an uncertainty of $0.2\ \text{cm}$. What is the total length, including uncertainty, of the 12 tiles if they are each placed side-by-side?

27. What is the perimeter, including uncertainty, of a rectangle with a length of (3.14 ± 0.15) cm and a width of (9.26 ± 0.53) cm?

28. What is the area, including uncertainty, of a rectangle with a length of (3.14 ± 0.15) cm and a width of (9.26 ± 0.53) cm?

29. What is the volume, including uncertainty, of a box with a length of (3.14 ± 0.15) cm, a width of (9.26 ± 0.53) cm, and a height of (6.26 ± 0.43) cm?

30. What is the perimeter/circumference, including uncertainty, of a circle with a radius of (3.83 ± 0.27) cm?

31. What is the area, including uncertainty, of a circle with radius of (3.83 ± 0.27) cm?

32. The volume of a right cone is given by the equation $V = \frac{1}{3}\pi r^2 h$. Determine the uncertainty in the radius of a right cone if the uncertainty in its volume is 6% and the uncertainty in its height is 8%.

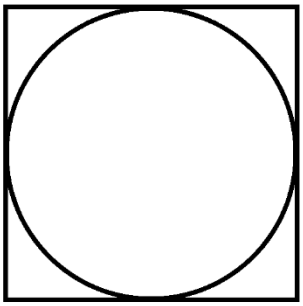
33. The surface area of a sphere is given by the equation $V = \frac{4}{3}\pi r^3$. Determine the uncertainty in the radius of a sphere if the uncertainty in its volume is 6%.

34. What is the volume, including uncertainty, of a sphere with radius of (3.83 ± 0.27) cm?

35. What is the speed, including uncertainty, of a boat which travels (31.41 ± 0.59) m in (2.65 ± 0.35) s?

36. A circle has a radius r and a square has a side length $2r$. Calculate the following:

$$\frac{\text{percent uncertainty of the area of the circle}}{\text{percent uncertainty of the area of the square}}$$



37. The length of two large bedrooms A and B are measured to be (25 ± 1) m and (20 ± 1) m. Order the four fundamental functions in order of the least percent uncertainty to the most percent uncertainty: $A + B$, $A - B$, $A \times B$, and $A \div B$.