

Honors Mathematics Skills Review

1. Solve the following equation $x = x_0 + v_0 t + \frac{1}{2} a t^2$ for each of the following variables.

a. $x_0 =$

b. $v_0 =$

c. $a =$

2. Solve the following equation $F = \frac{kq_1q_2}{r^2}$ for each of the following variables.

a. $k =$

b. $q_1 =$

c. $q_2 =$

d. $r =$

3. Solve the following equation $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ for each of the following variables.

a. $R_1 =$

b. $R_2 =$

4. Write out in words the steps you would follow to solve $I = \frac{V}{R}$ for R.

5. Write out in words the steps you would follow to solve $v^2 = v_0^2 + 2a(x - x_0)$ for v_0 .

6. Using the equation $\tau = rF \sin \theta$ when an applied force (F) of 150 Newtons creates a torque (T) of 450 Newton meters, the lever arm (r) must have been _____ meters if the force and the lever arm are perpendicular to each other.

Given	Formula	Substitution	Answer with Units

7. Using the equation $F = \frac{kq_1q_2}{r^2}$, when the charge of the first particle (q_1) is 1.6×10^{-6} Coulombs, the charge of the second particle (q_2) is 3.2×10^{-6} Coulombs, and the distance between the particles (r) is 0.2 m, the force between the two particles is _____ Newtons.

Given	Formula	Substitution	Answer with Units

8. Using the equation $\frac{1}{f} = \frac{1}{s_i} + \frac{1}{s_o}$, when the distance to the image (s_i) is 20 cm and the distance to the object (s_o) is 30 cm, the focal length of the mirror is _____ cm.

Given	Formula	Substitution	Answer with Units

9. Given the equation $J = F\Delta t$, if the force (F) remains constant and the change in time (Δt) while the objects were in contact is twice as much, how does the new impulse compare to the previous impulse?

10. Given the equation $K = \frac{1}{2}mv^2$, if the mass (m) of the object remains constant but the velocity (v) of the object is halved, how does the new kinetic energy (K) compare to the previous kinetic energy?

11. Given the equation $\Delta E = (\Delta m)c^2$, if the speed of light (c) remains constant but the mass (Δm) which is missing doubles, how does the new amount of energy (ΔE) produced compare to the previous amount of energy?

12. Given the equation $I = \frac{V}{R}$, if the total voltage (V) drop in a series circuit remains constant but the resistance (R) of the circuit triples, how does the new amount of current (I) in the circuit compare to the previous amount of current flowing in the circuit?

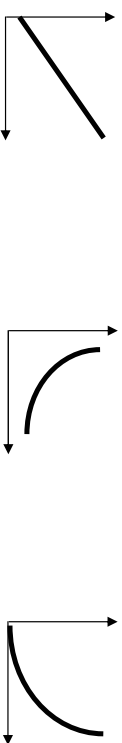
13. Given the equation $I = \frac{V}{R}$, if the voltage (V) of a battery connected to a series circuit is doubled and the resistance (R) of the circuit triples, how does the new amount of current (I) in the circuit compare to the previous amount of current flowing in the circuit?

14. How do you make measurements with proper precision?

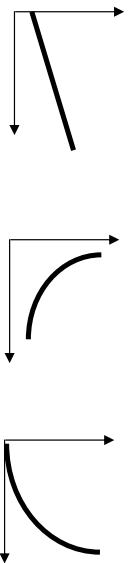
- A measurement is recorded as 20.23 ml. Assuming the measurement was recorded with proper precision, the smallest marking on the graduated cylinder was to what increment?
- If a triple beam balance has markings to the nearest tenth of a gram, which of the following readings indicate the correct precision for the instrumentation? 10 g, 10.1 g, 10.13 g, or 10.132 g
- Which of the following measurements indicates the greatest precision? 10 g, 10.1 g, 10.13 g, or 10.132 g

15. Compare and contrast data which is precise versus accurate.

16. Identify each of the following as direct or inverse relationships.



17. Identify each of the following as linear, parabolic, or hyperbolic relationships.

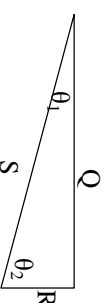


18. Identify each of the following data tables as showing an inverse or direct relationship.

1	10
2	40
3	90
4	160

1	120
2	60
3	40
4	30

19. Use the following diagram to answer the questions below. Note: the diagram may not be drawn to scale.



- If side S is 2.4 meters and angle θ_2 is 55° , what is the length of Q?
 - If the side R is 1.1 meters and angle θ_1 is 15° , what is the length of side S?
 - If side R is 1.8 meters and side Q is 3.2 meters, what is the measure of angle θ_2 in degrees?
20. Convert 35 km/hr to m/s. Show the dimensional analysis.

21. Five people **each** pull on a wagon loaded with firewood with a force of 500 Newtons. If the 5 people cause the loaded wagon to accelerate at 1.2 m/s^2 what was the mass of loaded wagon? Round your answer to the nearest whole number. $Acceleration = \frac{Force}{mass}$ When force is in Newtons, mass is in kilograms and acceleration is in m/s^2 .

Given	Formula	Substitution	Answer with Units

22. The equation for calculating the change in potential energy (PE) is: $PE = mgh$, where m is mass in kilograms, g is the acceleration due to gravity, (9.8 m/s^2) and h is the height (vertical displacement) in meters. The unit for energy is the Joule (J), which is a $\text{kg}\cdot\text{m}^2/\text{s}^2$.

At College Park, each step of the stairs increases one's vertical displacement by 30.0 cm. If a 56 kg student climbs up twenty steps of the stairs, what is their increase in potential energy in Joules? Round your answer to the nearest **whole number**.

Given	Formula	Substitution	Answer with Units

23. Aluminum has a density of 2.11 g/ml. If you take 3 kg of aluminum cans to the recycling plant, once the cans are melted, their volume will be _____ ml. Round your answer to the nearest

whole number: $Density = \frac{mass}{volume}$

Given	Formula	Substitution	Answer with Units