

1. If $F = \frac{G \cdot M \cdot m}{r^2}$, then

$r = \sqrt{\frac{F}{G \cdot M \cdot m}}$

$r = \sqrt{\frac{G \cdot M \cdot m}{F}}$

$r = \frac{G \cdot M \cdot m}{F}$

2. Let a be a real number. Find an expression for x in terms of a ,
if

$$y + 3x = 3a \text{ and } 2y - x = -a.$$

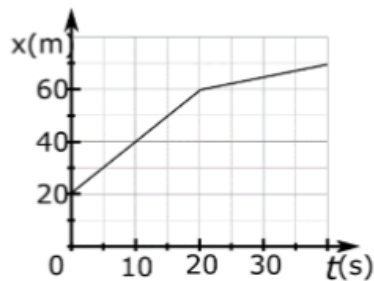
$$x =$$

Answer:

3. In February, Adam got a 15 % higher phone bill than in January. He paid 32.25 € in total for both months. How much was the bill in January?

Answer:

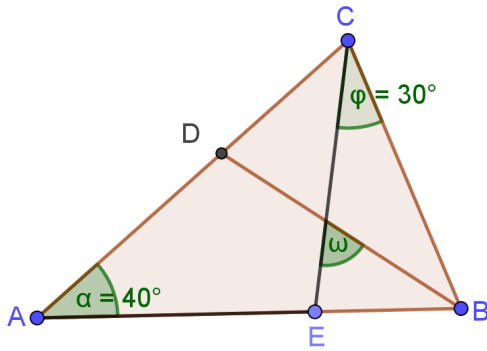
4. The time-position graph of a cyclist is given below.



Which statements about his motion are correct?

- His initial speed is greater than his speed 30 s later.
- The direction of his motion changes after 20 s.
- The total distance he has travelled is 50 m.
- After 20 s his acceleration is smaller than at the beginning of his motion.
- The total distance he has travelled is 70 m.

5. The line segment $[BD]$ lies on the bisector of the angle $\sphericalangle ABC$. Point E lies on the side $[AB]$ so that $|AE| = |CE|$. Additionally, $\sphericalangle BAC = 40^\circ$ and $\sphericalangle ECB = 30^\circ$. Find the size of ω .

Answer:

6. Line L passes through point $P(3, 1)$ and is parallel to the line given by the equation $y = -2x + 1$. Which of the following equations are equations of the line L ? There may be more correct answers.

- $y = \frac{1}{2}x - \frac{1}{2}$
- $y = -2x + 7$
- $y = 3x - 8$
- $2x + y + 7 = 0$
- $4x + 2y - 14 = 0$

7. Let $n \in \mathbb{Z}$. For which values of n is $\frac{n+1}{n-2}$ an integer (whole number)?

- $n \in \{2, -1\}$
- $n \in \{1, 3, 5, 7\}$
- For all odd integers.
- For all multiples of 3.
- $n \in \{-1, 1, 3, 5\}$

8. Which of the following objects is the closest star to the Earth?

- Alpha Centauri
- The Pole star
- The Sun
- The Moon

9. Ann has covered a circle with a radius of 3 cm with 21 small beans of approximately the same shape and size. In the next trial, she plans to cover a circle with a radius of 9 cm. About how many beans of similar size does she need for her trial?

- 42
- 126
- 189
- 63
- 1701

10. A glass presented in the sketch below is filled with water with constant flow. Which of the graphs best represent how the height of water changes with time?



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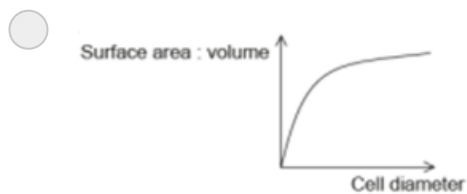
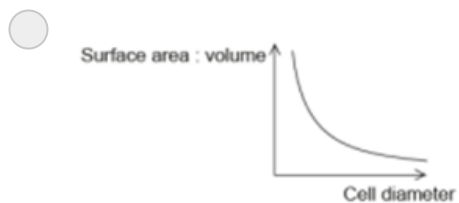
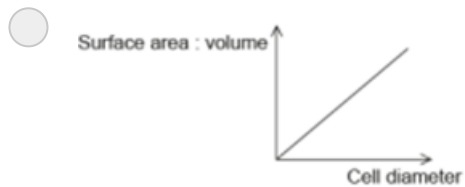
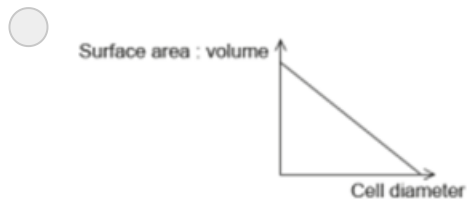
11. Are the genes of pancreatic cells and skeletal muscle cells of the same healthy person different?

- Sometimes
- No
- Slightly
- Yes

12. If a tulip is put into a vase, which contains sea water, what would happen?

- More water will leave tulip cells than enter its cells.
- Sodium chloride will leave the tulip cells.
- More water will enter tulip cells than leave its cells.
- The same amount of water will enter and leave tulip cells.

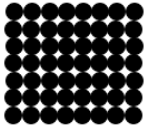
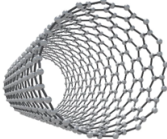
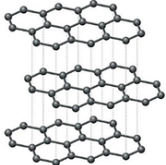
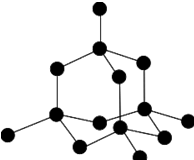
13. Which graph represents the change in cell surface area to volume ratio with increasing cell diameter?



14. Students learn that, under many environmental conditions, the behaviour of gases can be approximated using the Ideal Gas Law. However, in practice, many gases deviate somewhat from ideal gas behaviour. Using your knowledge of intermolecular forces, determine which of the following gases should have the lowest pressure when all other variables remain constant.

- Xe
- CO
- NH_3
- CH_4

15. Which diagram shows the structure of a diamond?

- 
- 
- 
- 

16. 1.0L of 0.010M $NaOH$ is added to 0.50L of water. What is the pH of the solution?

- 11.82
- 2.00
- 7.18
- 5.18

17. A sample of drinking water contains 1.5 mg of fluoride per dm^3 of water. A person drinks 1 dm^3 of this water. The recommended daily amount of fluoride is 4.0 mg. Which calculation gives the proportion of fluoride in percentages of the recommended daily amount of fluoride in 1 dm^3 of this water?

- $\frac{4.0}{1.5} \cdot 100\%$
- $\frac{1.5}{100} \cdot 4.0\%$
- $\frac{100}{1.5} \cdot 4.0\%$
- $\frac{1.5}{4.0} \cdot 100\%$

18. Which of the following is not a characteristic of a good theory?

- It predicts behaviour.
- It is reductionist - that is, it is focused on a single approach.
- It is able to be empirically tested.
- Its concepts can be measured.

19. Urry et al (2021) attempted to replicate the findings of Mueller and Oppenheimer's (2014) study. 142 undergraduate students participated in the experiment. Participants were randomly assigned to view one of five lectures in one of the following two conditions: taking notes by hand or with a laptop. The lectures were TED talks - each lasting about 15 minutes. They were the same talks that were used in the original study. The researchers provided each participant either with a pen and paper or the researcher's laptop on which to take notes. The lecture was shown on a monitor. When available, participants wore headphones/earbuds to minimize distraction. Participants were asked to take notes as if they were in a class lecture. When the video ended, participants completed a series of distractor tasks that lasted for about 30 minutes. Then they completed the quiz for the lecture they had viewed. The researchers found that taking notes using a laptop led to a higher word count than taking notes longhand. In addition, the laptop group's notes were often word for word from the lecture. However, there was no significant difference in the number of correctly answered questions.

What is the correct conclusion of this study?

- It appears that taking notes word by word results in detailed knowledge.
- It appears that the mode of note-taking had no significant effect on recall.
- It appears that watching TED talks and taking notes is useless.
- It appears that distraction tasks are the main cause of forgetting important information.

20. What is true about democracy? Mark all correct statements.

- A single party leads the country.
- The primary goal is to govern through fair representation and prevent the abuse of power.
- People choose their leadership.
- Citizens own means of production.

21. Which branch of philosophy is primarily concerned with the question of being?

- Existentialism
- Platonism
- Neo-positivism
- Humanism

22. Epistemology is the theory of...

- Knowledge
- Morality
- Metaphysics
- Politics

23. According to many Enlightenment political philosophies, the government should be divided into three branches. What are some attributes of each branch?

Judicial branch

Interprets the constitutionality of laws.

Legislative branch

Determines the laws that govern civil society.

Executive branch

Carries out and enforces laws.

24. Complete the sentence by selecting one of the given options.

Many people regret _____ the opportunity to go to university.

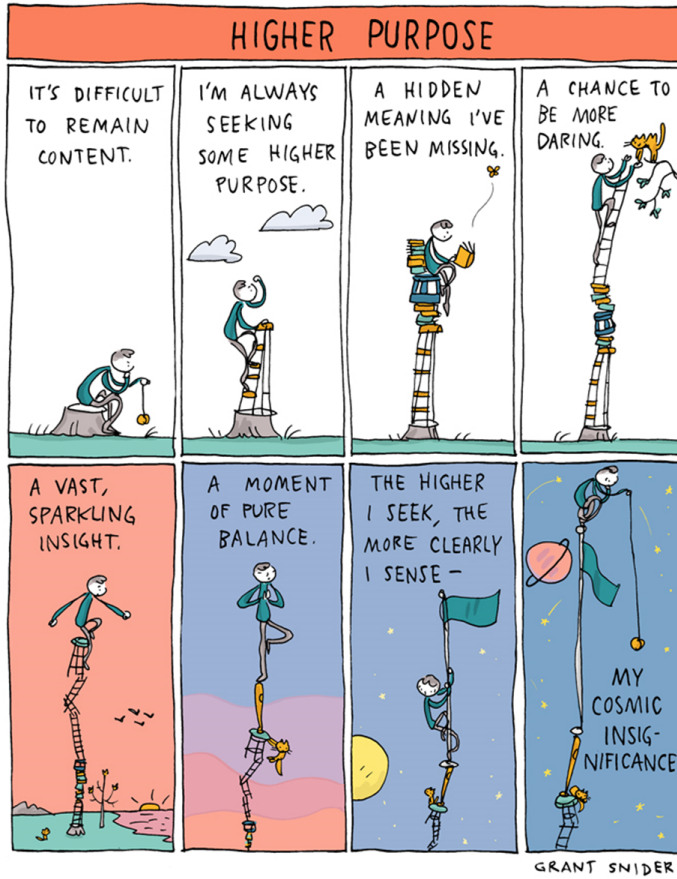
- not have
- not to have
- not having
- not to have had

25. Complete the sentence by selecting one of the given options.

If you _____ at your boss that day, you'd probably still have the job now!

- don't shout
- didn't shout
- wouldn't shout
- hadn't shouted

26. Read the text below and find the answer that fits best.



- The text is a comic strip which communicates human's innate curiosity and insatiable desire to find meaning and purpose in life and the existential frustration that results from it.
- The text is a cartoon which provokes the reader to think about the quest for higher purpose and a desire to find life's true meaning.
- The text is a drawing depicting subject's constant search for meaning and the eventual realization of the futility of his own existence.
- The text is a how-to guide on how to find higher purpose in life and the eventual realization of the futility of his own existence.

27. Read the poem.

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
I hold with those who favour fire.
But if it had to perish twice,
I think I know enough of hate
To say that for destruction ice
Is also great
And would suffice.
(*Fire and Ice* by Robert Frost)

Identify the rhetorical device used in words "fire" and "ice", taking into consideration that these are also the main motifs in this poem.

- Antithesis**
 - Simile**
 - Contrast**
 - Parallelism**
- 28. What was the name of the agreement that ended World War I in 1919?**
- The Treaty of Paris**
 - The Treaty of Brest-Litovsk**
 - The Treaty of Versailles**
 - The Treaty of Trianon**
- 29. Which of the following was not a key feature of fascism in the 20th century?**
- The promotion of individual freedom and civil rights**
 - A focus on militarism and war**
 - A belief in the superiority of one's own race or nation**
 - Extreme nationalism**
- 30. Which country was not one of the Allied Powers during World War II?**
- The United States**
 - The Soviet Union**
 - The United Kingdom**
 - Japan**

31. **What was the main cause of the Cold War?**

- A lack of trust between the US and the Soviet Union**
- The spread of communism**
- Economic inequality between the superpowers**
- The failure of the League of Nations**

32. **Who was the leader of the Soviet Union during the Cuban Missile Crisis?**

- Boris Yeltsin**
- Joseph Stalin**
- Vladimir Lenin**
- Nikita Khrushchev**

