HOPE TUTORIAL CENTER (HTC)
For Primary, High School and College Preparatory Student
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Name . . . . . Grade . . . Section . . . Time Allowed . . . . .

11 Years Grade 11 Physics EUEE Questions For Home Tutor Program

UNIT 1 MEASUREMENT AND PRACTICAL WORK

2007E,C EUEE

1. Which one of the following experimental errors can be reduced by taking repeated measurements?

A. Parallax errors B. random errors C. systematic errors D. zeros errors

2. A teacher gave a student book whose thickness is 4.30cm and instructed him to measure the thickness of the book with vernier calipers .The student book measurements. The arithmetic mean and the standard deviation are 4.33cm and 0.04 cm respectively. Which one of the following is the uncertainty in the accuracy of the measurement?

A. 0.03cm B. 0.04cm C. 0.035cm D.0.30cm

2008E,C EUEE

3. Which statement is **WRONG** about units and dimensions?

A. Two quantities can have the same units but different dimensions
B. Two quantities can have the same dimensions but different units
C. It is always possible to add two numbers that have the same units
D. There are quantities that have no unit and dimension

2009E,C EUEE

4. If a precision of surveyor measured a distance of 500 meters /b/n two points in a village /using a meter that has centimeter division on it. Then what is the measurement result?

A. 500m B. 500.0m C. 500.00m D. 500.000m

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2010E,C EUEE

5. Which of the following is correct about errors in measurement?
A. Errors occur in every scientific investigation
B. Experimental error is the same as mistake
C. Errors make measured values same as accepted value
D. Errors can be avoided by using modern measuring instruments

6. What can be concluded when the number of significant figures increases ?
A. true reading increases B. accuracy increases
C. uncertainty increases D. precision increases

2011E,C EUEE

7. What part of a scientific report discusses the accuracy of measurements taken?
A. Aim B. Theory C. Methods D. results

8. A grade11 physics teacher ordered four of his students to measure the length of a classroom .He provided them the following length measuring instruments .The instruments are meter rule with millimeter division ,vernier calipers, micrometer screw gauge and meter tape with centimeter scale, but its zero reading is not visible .Which of these instruments is appropriate for the task?
A. Meter rule B. meter tape C. vernier calipers D. micrometer screw gauge

2012E,C EUEE

9. A scientific method
A. Begins form an accepted scientific theory and concludes with designing an experiment
B. Is a scientific procedure where a researcher first predicts the result of a problem before proposing the possible hypothesis
C. Is a scientific procedure in which a researcher begins with performing experiments
D. Is a scientific procedure which ensures rigorous evidence –based structure in which only ideas that have been carefully tests dare accepted as scientific theory

10. Which of the following is correct about accuracy and precision of a measurement?
A. A more accurate measurement has larger uncertainty, whereas more precise measurement has smaller uncertainty.
B. Accuracy is related to the number of significant figures ,whereas precision describes how well we minimize random errors
C. Accuracy refers to the closeness of repeatedly measured data to a true value, whereas precision is related to the closeness of measured data to each other.
D. Accuracy describes the closeness of repeatedly measured data to each other , whereas precision describes closeness of a data to a true value .

2013/ 2014E,C EUEE

11. A student wants to measure the length and height of the school laboratory. There are vernier calipers, meter stick micrometer screw gauge and meter tape measuring instruments in the laboratory. Which one of the following measurements instrument and unit is appropriate for the measurement?
A. Meter tape and meter C. Vernier calipers and millimeter
B. Micrometer screw gauge and millimeter D. meter stick and centimeter

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12. In reporting an experimental result, the collected data has to be clearly tabulated with appropriate units. Which of the following table correctly represents a data collected during an experiment?

A.

Voltage	4V	6V	8V	12V	16V
Current	0.5I	0.75I	1I	1.5I	2.0I

C.

Voltage(V)	4	6	8	12	16
Current(C)	0.5	0.75	1	1.5	2.0

B.

Voltage(V)	4	6	8	12	16
Current (A)	0.5	0.75	1	1.5	2.0

D.

Voltage	4V	6V	8V	12V	16V
Current	0.5C	0.75C	1C	1.5C	2.0C

Self- Test Exercise

1. The actual range of values around a measurement is
A. Uncertainty B. error C. precision D. accuracy

2. What is the number of significant figures in ***504.700***?
A. 4 B. 5 C.6 D.3

3. Which of the following measurements is ***most precise***?
(A) 4.00mm (B)4.00cm (C) 4.00m (D)40.00m

4. According to Joule's law of heating, heat produced $H = I^2 R t$, where I is current, R is resistance and t is time. If the errors in the measurement of I, R and t are 3%, 4% and 6% respectively then what is the ***error*** in the measurement of H?
(A) ±17% (B) ± 16% (C) ± 19% (D) ±25%

5. Which one of the following errors can cause your readings to be less accurate because of the ***position of your eye***?
A. Random errors B. zero errors C. Parallax errors D. systematic errors

6. Which one is **false** about rules of significant figures?
A. All the zeroes between two non−zeroes digits are significant
B. The zeroes at the end without a decimal point are not significant.
C. The powers of ten are counted as significant digits
D. A final zero or trailing zeros in the decimal portion are **only** significant.

7. The process of examining in detail to discover the meaning of a set of results in scientific method is called_____
A. Hypothesis B. Experiment C. Analyze D. Conclusion

8. Which of the following is ***false*** statement about errors?
A. Systematic errors cause a bias in your readings (they are all either too high or too low).
B. Random errors cause readings to be above and below the true value.
C. Parallax errors can cause your readings to be less accurate because of the position of your eye.
D. Zero errors are special examples of a random error.

9. ***Random error*** can be eliminated by
(A) Careful observation (C) measuring the quantity with more than one instrument
(B) Eliminating the cause (D) taking large number of observations and then their mean

10. Which one of the following is the correct procedure in scientific method?
A. observing ,researching ,predicting ,hypothesizing, experimenting, analyzing, concluding
B. observing ,researching ,predicting ,hypothesizing, analyzing, experimenting, , concluding
C. observing ,researching , hypothesizing, predicting experimenting, analyzing, concluding
D. observing ,researching ,predicting , experimenting, analyzing, concluding

11. Accuracy of measurement is determined by
(A) Absolute error (B) Percentage error (C) Both (D) None of these

12. What is the number of significant figures in 0.310×10^3?
(A) 2 (B) 3 (C) 4 (D) 6

13. Which of the following numerical values have three significant figures.
A. 3.033 B. 0.030 C. 30.30 D. 0.300

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14. Which of the following is ***false*** statement?

A. A series of precise measurements will have very little variation.
B. More precise instruments have smaller scale divisions.
C. Precision is a measure of the degree of 'exactness' of your value.
D. A series of inaccurate readings are clustered around the true value.

15. The radius of a sphere is (5.3 ± 0.1) cm. The percentage error in its volume is

(A) $\frac{0.1}{5.3}$ x 100 (B) 3 x $\frac{0.1}{5.3}$ x 100 (C) $\frac{0.1\ x\ 100}{3.53}$ (D) 3+ $\frac{0.1}{5.3}$ x 100 .

16. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimation of the kinetic energy obtained by measuring mass and speed.

(A) 11% (B) 8% (C) 5% (D) 1%

17. The random error in the arithmetic mean of 100 observations is x; then random error in the arithmetic mean of 400 observations would be

(A) 4x (B) $\frac{1}{4}$ x (C) 2x (D) $\frac{1}{2}$ x

18. A wire has a mass 0.3 ± 0.003 g , radius 0.5 ± 0.005 mm and length 6 ± 0.06 cm . The maximum percentage error in the measurement of its density is

(A)1 (B) 2 (C) 3 (D) 4 15.

19. If 97.52 is divided by 2.54, the correct result in terms of significant figures is

(A) 38.4 (B) 38.3937 (C) 38.394 (D) 38.39

20. A physical quantity P is given by $\mathbf{P} = \frac{A^3 B^{\frac{1}{2}}}{C^{-4} D^{\frac{3}{2}}}$. The quantity which brings in the maximum percentage error in P is

(A) A (B) B (C) C (D) D

21. The resistance R = $\frac{V}{I}$, where V= 100 ± 5 volts and I = 10 ± 0.2A. What is the total error in R?

(A) 5% (B) 7% (C) 5.2% (D) $\frac{5}{2}$ %

22. A physical quantity A is related to four observable a,b, c and d as follows, $\mathbf{A} = \frac{a^2 b^3}{c\sqrt{d}}$, the percentage errors of measurement in a,b, c and d are 1%,3%,2% and 2% respectively.
What is the percentage error in the quantity?

(A) 12% (B) 7% (C) 5% (D) 14%

23. A physical parameter a can be determined by measuring the parameters b, c, d and e using the relation $\mathbf{a} = \frac{b^{\alpha} c^{\beta}}{d^{\gamma} e^{\delta}}$. If the maximum errors in the measurement of b, c, d and e are b_1%, c_1%, d_1% and e_1%, then the maximum error in the value of a determined by the experiment is

(A) $(b_1 + c_1 + d_1 + e_1)$% (C) $(b_1 + c_1 - d_1 - e_1)$%
(B) $(\alpha b_1 + \beta c_1 - \gamma d_1 - \delta e_1)$% (D) $(\alpha b_1 + \beta c_1 + \gamma d_1 + \delta e_1)$%

24. A quantity is represented by $\mathbf{X = M^a L^b T^c}$ .The percentage error in measurement of M ,L and T are α % , β% and γ% respectively. The percentage error in X would be

A.(aα + b β - cγ)% B. (aα + b β + cγ)% C. (aα - b β - cγ)% D .0%

25. Calculate the percentage error in determination a time period of a pendulum T = $2\pi\sqrt{\frac{L}{g}}$ where ,L and g are measured with ±2% and ±3% respectively.

A.2.9% B.2.5% C.1.5% D.1.9%

26. The digits which tell us the number of units we are reasonably sure of having counted in making a measurement are called_____

A. Uncertainties B. errors C. significant figures D. percentage errors

27. What type of errors can be minimized by repeating the measurements many times and taking the arithmetic mean of all the values as the correct reading?

A. Random error B. systematic errors C. gross errors D. constant errors

28. Which one of the following is ***incorrect*** statement?

A. The measurement of a physical quantity is said to be precise if the random error is small.
B. Errors are always additive in nature.
C. The error in reading a scale due to the wrong positioning of the eye is called systematic error
D. All the zeroes between two non−zeroes digits are significant.

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29. The accepted value is 15.63. Which correctly describes this student's experimental data?

Trials	Trial 1	Trial 2	Trial 3	Trial 4
Measurements	12.84	13.02	12.96	12.08

A. Accurate but not precise C. precise but not accurate
B. Both accurate and precise D. neither accurate nor precise

30. If 97.52 is ***divided*** by 2.54, the correct result in terms of significant figures is
(A) 38.4 (B) 38.3937 (C) 38.394 (D) 38.39

31. The volume of two bodies is measured to $V_1 = (10.2 \pm 0.02)cm^3$ and $V_2 = (6.4 \pm 0.01)cm^3$. The ***sum*** and ***differences*** in volumes with error limits is
A. $(16.6 \pm 0.03)cm^3$ and $(3.8 \pm 0.03)cm^3$ C. $(16.2 \pm 0.03)cm^3$ and $(3.6 \pm 0.03)cm^3$
B. $(16.6 \pm 0.01)cm^3$ and $(3.8 \pm 0.01)cm^3$ D. $(16.2 \pm 0.03)cm^3$ and $(3.6 \pm 0.01)cm^3$

32. ***Accuracy*** of a measurement is an indication of
A. How far the reading is away from the average value
B. How many digits we use to display the data?
C. How close the reading is to the conventional true value?
D. The smallest incremental quantity that we can identify

33. Which one of the following is ***false*** statement?
A. Viewing from directly above avoids a parallax error.
B. Uncertainty is a measure of your confidence in your measurement.
C. 'Trailing zeroes' like zeroes in 3.20000 are considered as significant.
D. Zero errors are special examples of a random error.

34. The volume of a pyramid with base length l,base width w, and height h is given by $\boldsymbol{V = \frac{l\,w\,h}{3}}$.The volume of the pyramid was measured with an uncertainty of 12%, while the base length and base width were measured with an uncertainty of 4%. What is the uncertainty of the ***height*** of the pyramid?
A. 2% B. 3% C. 4% D.6%

35. Which of the following error is caused by poor calibration of the instrument?
Random error B. systematic error Parallax error D. gross error

UNIT 2 VECTORS

2002E,C EUEE

1. The vector product of two non –collinear vectors A and B
A. is perpendicular to the plane formed by A and B B. must be zero
C. is on plane formed by A and B D. Is a scalar quantity

2. Which of the following is not true of the vector product?
A. $\vec{A}$ x $\vec{B}$ = - $\vec{B}$ x $\vec{A}$ C. $\vec{A}$ x ($\vec{B}$+ $\vec{C}$) = $\vec{B}$ x $\vec{A}$ + $\vec{A}$ x $\vec{C}$
B. $\vec{A} \perp \vec{B} \Rightarrow |\vec{A}$ x $\vec{B}|$ = AB D . $\vec{A} \parallel \vec{B} \Rightarrow \vec{A}$ x $\vec{B}$ = 0

2003E,C EUEE

3. Suppose $\vec{A} = 3\hat{\imath} - 2\,\hat{\jmath} + \hat{k}$ and $\vec{B} = -\hat{\imath} - 4\hat{\jmath} + 3\hat{k}$ and $\vec{C}$ is a vector lying along x- axis with the property that $\vec{A}(\vec{B} + \vec{C}) = 0$ .Then the vector $\vec{C}$ is given by
A. $\frac{3}{\sqrt{10}}\hat{\jmath}$ B. $\frac{6}{\sqrt{10}}\hat{\jmath}$ C. $\frac{-11}{3}\hat{\imath}$ D . $\frac{-8}{3}\hat{\imath}$

4. Suppose $\vec{A} = 3\hat{\imath} - 2\,\hat{\jmath} + \hat{k}$ and $\vec{B} = -\hat{\imath} - 4\hat{\jmath}$ and $\vec{C}$ are three vectors in xy - plane lying with the property that $\vec{A} + \vec{B} - \vec{C} = 0$ .which of the following is a unit vector along $\vec{C}$?
B. $2\hat{\imath} - 6\hat{\jmath}$ B. $\frac{3}{\sqrt{10}}\hat{\imath} + \frac{6}{\sqrt{10}}\hat{\jmath}$ C. $-2\hat{\imath} + 6\hat{\jmath}$ D . $\sqrt{\frac{1}{10}}\hat{\imath} - \frac{3}{\sqrt{10}}\hat{\jmath}$

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2004E,C EUEE

5. The sum and difference if two non-zero vectors $\vec{A}$ and $\vec{B}$ are equal in magnitude .What can you conclude about these two vectors?

A. $\vec{A}$ and $\vec{B}$ have the same direction C. $\vec{A}$ and $\vec{B}$ have the opposite direction

B. $\vec{A}$ and $\vec{B}$ have the same magnitude D. $\vec{A}$ and $\vec{B}$ are perpendicular to each other

6. Suppose $\vec{A} = 3\hat{\imath} - 2\,\hat{\jmath}$ and $\vec{B} = -\hat{\imath} - a\hat{\jmath}$ are two vectors in xy plane .what is the value of a such that $\vec{A} + \vec{B} = 2\hat{\imath}$.

A. 3 B. 2 C. -2 D. -3

2005E,C EUEE

7. A vector that represents the position of an object in relation to another object is called

A. Unit vectors B. position vectors C. coplanar vectors D. collinear vectors

8. Two non zero vectors **A** and **B** are related by **A = c B ,** where c is a scalar .If the two vectors have opposite directions, then one of the following statement is true ?

A. c is a positive number B. c is a negative number C. c = 1 D. C =0

9. If **A** $= 8\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and **B** $= 5\hat{\imath} - 3\hat{\jmath} + \hat{k}$,the **B x A =** _____

A. $3\hat{\imath} + 4\hat{\jmath} - 3\hat{k}$ **B.** $-3\hat{\imath} - 4\hat{\jmath} + 3\hat{k}$ **C.** $-5\hat{\imath} - 18\hat{\jmath} - 29\hat{k}$ **D.** $5\hat{\imath} + 18\hat{\jmath} + 29\hat{k}$

2006E,C EUEE

10. Two non-zero vectors D and E have precisely equal magnitudes .For the magnitude of D + E to be 3times larger than the magnitude of D – E ,What must be the angle between D and E?

A. 30^0 B. 60^0 C. 37^0 D. 53^0

11. The vector 2i + j + k is perpendicular to i- 4j + λk if λ is equal to

A. 0 B. -1 C. 2 D. 3

2007E,C EUEE

12. The magnitude of two vectors A and B are 12units and 5units respectively. Which of the following is not the possible value for the magnitude of the resultant A + B?

A. 60units B.17units C. 13units D.7units

13. What is the vector product AxB of two vectors A = 7i + 4j -8k and B = 3i – 2j + 5k?

A. 36i + 11j – 2k B. 4i – 59j – 26k C. -4i +59j +26k D. -36i -11j +2k

14. What is the angle between vectors A = (ai + a$\sqrt{3}$ j)units and B= (a$\sqrt{3}i$ + aj)units?

A. 90^0 B. 60^0 C. 37^0 D. 30^0

2008E,C EUEE

15. An airplane flies at speed of 720.0 km/hr at 37^0 North of west direction. How far does the travel to the west in 1 hour?

A. 432km B. 720km C. 576km D. 504km

16. Determine the torque due to a force F = 2i – 3j + 4k N acting at a point r = 3i + 2j +3k?

A. 6i -6j +12k B. -6i +6j +12k C. 17i - 6j - 13k D. -17i + 6j + 13k

2009E,C EUEE

17. If vector **P** is 6m in the x-direction and vector **Q** is 8m in the y- direction .Then what is the value of the vector **P** + **Q**?

A. 10m at 53^0 from x –direction B. 10m at 37^0 from x –direction

C. $\sqrt{136}m$ at 30^0 from x –direction D . $\sqrt{136}m$ at 45^0 from x –direction

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18. Given vectors A = $\sqrt{3}i$ + j and B = $\sqrt{3}i$ - j .What is the smaller angle between the vectors ?

A. 90^0 B. 60^0 C. 53^0 D. 45^0

19. If $\vec{A}$ = $\hat{x}$m/s + 3m/s $\hat{z}$, and $\vec{B}$ = 2m/s $\hat{y}$ + 3m/s $\hat{z}$, then what is the value of $|\vec{A} \times \vec{B}|$?

A. $\sqrt{10}m/s$ B. $\sqrt{13}m/s$ C.7m/S D. $\sqrt{130}\,m/s$

2010E,C EUEE

20. Two forces F1= (8i + 3j)N and F2= (4i + 6j)N are acting on an object. What is the magnitude and direction of the resultant force?

A. 5N, -37^0 B. 15N, 37^0 C. 5N, 143^0 D. 225N, 143^0

21. Four vectors are given below $\vec{A} = \begin{bmatrix} 4 \\ 10 \end{bmatrix}$, $\vec{B} = \begin{bmatrix} 2 \\ -5 \end{bmatrix}$, $\vec{C} = \begin{bmatrix} -6 \\ 15 \end{bmatrix}$, $\vec{D} = \begin{bmatrix} 15 \\ -6 \end{bmatrix}$,

Which pair of the vectors is orthogonal ?

A. $\vec{A}$ and $\vec{B}$ B. $\vec{B}$ and $\vec{C}$ C. $\vec{C}$ and $\vec{D}$ D. $\vec{A}$ and $\vec{D}$

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22. Let $\vec{C}$ = $\vec{A}$ x $\vec{B}$ and $\theta \neq 90^0$,where θ is the smaller angle between $\vec{A}$ and $\vec{B}$ when they are drawn with their tails at the same point. Which of the following is **NOT** true?

A) $\vec{A} \cdot \vec{C} = 0$ B. - $\vec{C}$ = $\vec{B}$x $\vec{A}$ C. $|\vec{C}| = |\vec{A}||\vec{B}|\sin\theta$ D . $\vec{A} \cdot \vec{B} = 0$

23. What is the magnitude of the resultant velocity for a bird flying first at a speed of 10m/s North East and then flying to South at a speed of 8m/s?

A. 7.13m/s B. 16.6m/ C. 12.8m/s D. 7.07m/s

24. Two forces exerted on a block as shown in the figure below .

What is the horizontal component of the net force?

A .70N ,East B. 30N, West

C. 14N, West D. 28N, West



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25. Given four vectors $\vec{A}$ = 2i – j , $\vec{B}$ = 4i – 2j , $\vec{C}$ = i- j and $\vec{D}$ = 2i + 3j ,which pairs of these vectors are collinear?

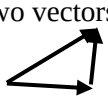
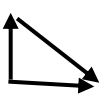
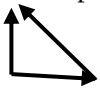
A. $\vec{A}$ and $\vec{B}$ B. $\vec{C}$ and $\vec{D}$ C. $\vec{A}$ and $\vec{C}$ D. $\vec{B}$ and $\vec{C}$

26. Consider two forces in x-y plane : F_1 = 10N , making a 30^0 angle above the horizontal and F_2 = 20N , making a 60^0 angle above the horizontal. Which of the following is true ?

A. The magnitude of their resultant is 42N
B. The direction of their resultant vector is 45^0 above the horizontal
C. The horizontal and vertical components of their resultant are 15N and 26N respectively.
D. The horizontal and vertical components of their resultant are 18.66NN and 23.32N respectively.

2013/2014E.C EUEE

27. Two vectors of magnitude 8 units in the direction of East and the second vector of magnitude 6 units in the direction of North are given. If you add the two vectors using graphical method, which represents the resultant of the two vectors?

A.  B.  C.  D. 

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28. Which of the following pairs of vectors are collinear?

A. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}-4\\-2\end{bmatrix}$ B. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}4\\-2\end{bmatrix}$ C. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}-4\\2\end{bmatrix}$ D. $\begin{bmatrix}-4\\-2\end{bmatrix}, \begin{bmatrix}4\\-2\end{bmatrix}$

Self-Test Exercise

1. Which one of the following is ***incorrect*** statement about ***Vectors***?
   A. When you multiply a vector by a scalar, the magnitude of the vector changes, but not its direction.
   B. If the vector $\vec{A}$ is projected on to vector $\vec{B}$ the scalar projection gives the magnitude of the component of $\vec{A}$ that is in the direction of $\vec{B}$.
   C. The vector product of two vectors is when two vectors are multiplied together to produce another vector.
   D. The scalar product of two vectors is when they are multiplied together to give a vector quantity
2. A vector that is limited to only dimension which acts in opposite or the same direction is called
   A. Unit vectors B. position vectors C. coplanar vectors D. collinear vectors
3. Which one of the following is ***INCORRECT*** statement?
   A. The order in which vectors is added will affect the end the result.
   B. For any two non-zero vectors $\vec{A}$ and $\vec{B}$,if $\vec{A} \times \vec{B} = \vec{C}$, then $\vec{A} \cdot \vec{C} = 0$
   C. For orthogonal unit vectors $\hat{\imath}$, $\hat{\jmath}$ and $\hat{k}$, $\hat{\imath} \times \hat{\imath} = \hat{\jmath} \times \hat{\jmath} = \hat{k} \times \hat{k} = 0$
   D. For orthogonal unit vectors $\hat{\imath}$, $\hat{\jmath}$ and $\hat{k}$, $\hat{\imath} \cdot \hat{\jmath} = \hat{\jmath} \cdot \hat{k} = \hat{\imath} \cdot \hat{k} = 0$
4. Which one of the following is false about the vectors **U** and **V**?
   A. If the vector U is perpendicular to the vector V , then **U . V = 0**.
   B. If the vector U is parallel to the vector V , then $\boldsymbol{U} \cdot \boldsymbol{V} = |\boldsymbol{U}|\,|\boldsymbol{V}|$.
   C. If the vector U is perpendicular to the vector V , then $|\boldsymbol{U} \times \boldsymbol{V}| = |\boldsymbol{U}|\,|\boldsymbol{V}|$.
   D. If the vector U is parallel to the vector V , then **U** x **V** = - **U** x **V**

   Using the following vectors given below to answer questions from 5 - 6

   $\vec{A} = \begin{bmatrix}2\\3\\4\end{bmatrix}$, $\vec{B} = \begin{bmatrix}4\\5\\3\end{bmatrix}$ and $\vec{C} = -3\hat{\imath} + 4\hat{\jmath}$

5. Which one of the following is ***false*** statement
   A . The area of a parallelogram formed by $\vec{A}$ and $\vec{B}$ is 15 square units
   B. The scalar projection of $\vec{B}$ onto $\vec{C}$ is $\frac{8}{5}$
   C. The volume of parallelepiped formed by $\vec{A}$, $\vec{B}$ and $\vec{C}$ is 73 cubic units
   D. the vector perpendicular to both $\vec{A}$ and $\vec{B}$ is -11i + 10j - 2k
6. The angle between the vectors i – j and j- k is
   (A) $\frac{\pi}{3}$ (B) $\frac{5\pi}{6}$ (C) $\frac{2\pi}{3}$ (D) $\frac{-\pi}{3}$
7. The resultant of two forces 3P and 2P is R. If the first force is doubled then the resultant is also doubled. The angle between the two forces is
   (A) 60^0 (B) 120^0 (C) 70^0 (D) 180^0
8. If a vector $\vec{P}$ making angles α, β , and γ respectively with the X, Y and Z axes respectively. Then $Sin_{\alpha}^2 + Sin_{\beta}^2 + Sin_{\gamma}^2$ = _____
   A. 1 B. 0 C. 2 D. 3
9. For what value of m such that the vectors A = mi + 5j –k and b= mi + mj + 6k orthogonal to each other?
   A.{6,1} B. {-6,-1} C.{-6,1} D. {6,-1}
10. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$ then value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$ is
    (A) 1 (B) 3 (C.) $\frac{-3}{2}$ (D) -3

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11. What is the magnitude of the vector $\vec{C}$ that satisfies the equation $2\vec{A} - 6\vec{B} + 3\vec{C} = 2\hat{j}$, where $\vec{A} = \hat{i} - 2\hat{k}$ and $\vec{B} = -\hat{j} + \frac{1}{2}\hat{k}$?

A. $\sqrt{\frac{23}{2}}$ B. $\sqrt{\frac{23}{5}}$ C. $\frac{\sqrt{23}}{3}$ D. $\sqrt{\frac{23}{3}}$

12. If $\vec{A} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{B} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{C} = \hat{i} + 3\hat{j} - \hat{k}$, find λ such that $\vec{A}$ is perpendicular to $\lambda\vec{B} + \vec{C}$?

(A) -2 (B)2 (C) 4 (D)4

13. Find all vectors of magnitude $10\sqrt{3}$ that are perpendicular to the plane of $\hat{i} + 2\hat{j} + \hat{k}$ and $-\hat{i} + 3\hat{j} + 4\hat{k}$

(A) $\pm 10(\hat{i} - \hat{j} + \hat{k})$ (B) $\frac{\pm 10(\hat{i} - \hat{j} + \hat{k})}{\sqrt{3}}$ (C) $\frac{\pm 5(\hat{i} - \hat{j} + \hat{k})}{\sqrt{3}}$ (D) $\frac{\pm(\hat{i} - \hat{j} + \hat{k})}{\sqrt{3}}$

14. The vector in the direction of the vector $\hat{i} - 2\hat{j} + 2\hat{k}$ that has magnitude 9 is

(A) $\hat{i} - 2\hat{j} + 2\hat{k}$ (B) $3(\hat{i} - 2\hat{j} + 2\hat{k})$ (C) $\frac{\hat{i} - 2\hat{j} + 2\hat{k}}{3}$ (D) $9(\hat{i} - 2\hat{j} + 2\hat{k})$

15. The unit vector perpendicular to the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right-handed system is

(A) $\hat{k}$ (B) $-\hat{k}$ (C) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$ (D) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

16. If $|\vec{A}| = 10$, $|\vec{B}| = 2$, and $|\vec{A}.\vec{B}| = 12$, the value of $|\vec{A} \times \vec{B}|$

(A) 5 (B) 10 (C) 14 (D) 16

17. Vectors $\vec{P}$ and $\vec{Q}$ make an angle $\theta = \frac{\pi}{6}$. If $|\vec{P}| = \sqrt{3}$ and $|\vec{Q}| = 1$, then which one is not true?

(Take $\text{Cos}\frac{\pi}{6} = \frac{\sqrt{3}}{2}$, $\text{Sin}\frac{\pi}{6} = \frac{1}{2}$)

(A) $|\vec{P} + \vec{Q}| = \sqrt{7}$ (B) $|\vec{P} - \vec{Q}| = 1$ (C) $|\vec{P} \times \vec{Q}| = \frac{\sqrt{3}}{2}$ D) $\vec{P} \cdot \vec{Q} = \frac{1}{2}$

18. Which one of the following is false statement

A) If the vector $\vec{A}$ is parallel to the vector $\vec{B}$, then $\vec{A} \times \vec{B} = 0$

B) For any two vectors $\vec{A}$ and $\vec{B}$, $|\vec{A} \times \vec{B}| = |\vec{B} \times \vec{A}|$

C) If the vector $\vec{A}$ is perpendicular to the vector $\vec{B}$, then $|\vec{A} \times \vec{B}| = |\vec{A}||\vec{B}|$.

D) For any two vectors $\vec{A}$ and $\vec{B}$, $(\vec{A} \times \vec{B}).\vec{A} \neq 0$.

19. Of the following quantities, which one is a ***vector*** quantity?

A)The speed of a car (B) How long it takes to do a physics assignment.

(C)The cost of a theater ticket (D) The acceleration of a car

20. Which one of the following is ***false*** statement about vectors?

A) For any two vectors $\vec{A}$ and $\vec{B}$, $|\vec{A} \times \vec{B}| = |\vec{B} \times \vec{A}|$. B) If $\vec{A} \perp \vec{B}$, then $\vec{A} \cdot \vec{B} = 0$

C) Vector product is commutative. D)If $\vec{A} \,||\, \vec{B}$, then $\vec{A} \times \vec{B} = 0$

21. If $\vec{A} = 2i - 3j + k$ and $\vec{B} = -i + 2j + 7k$ then $\vec{A} \cdot \vec{B}$ is equal to:

(A) - 1 (B) -2 (C)-3 (D) -4

22. ***Magnitude*** of the vector $2i - 2j - k$ is:

(A) 4 (B) 3 (C) 2 (D) 1

23. ***Unit vector*** of $i - 2j - 2k$ is:

(A)$i - 2j - 2k$ (B) $\frac{1}{3}(i - 2j - 2k)$ (C) $\frac{1}{\sqrt{3}}(i - 2j - 2k)$ (D) $\frac{1}{2}(i - 2j - 2k)$

24. If $\hat{i}$, $\hat{j}$ and $\hat{k}$ are orthogonal unit vectors, then $\hat{j} \times \hat{i}$ is:

(A) $\hat{k}$ (B)$-\hat{k}$ (C) 1 (D) 0

25. The ***cross product of*** two vectors $\vec{A}$ and $\vec{B}$ is:

A) $|\vec{A}||\vec{B}|\text{Cos}\theta$ (B) $|\vec{A}||\vec{B}|\text{Sin}\theta$ C) $|\vec{A}||\vec{B}|\text{Sin}\theta\,\hat{n}$ (D) $|\vec{A}||\vec{B}|\text{Cos}\theta\,\hat{n}$

26. If $\vec{A} = 3i + 4j - 3k$ and $\vec{B} = i + 3j + 2k$, then $\vec{A} \times \vec{B} =$_____

A. $-17i + 9j - 5k$ B) $17i - 9j + 14k$ C) $17i - 9j + 5k$ D) $17i - 9j + 5k$

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27. For what value of m such that the vectors A = mi + 5j –3k and b= 2i + 10j - 6k ***Parallel*** to each other?
A.{2} B. {-2} C.{1} D. {-1}

28. For what values of λ the vectors 2i – j + 2k and 3i + 2λj are ***perpendicular*** ?
A) 3 B)-3 C)2 D)-2

29. If $\vec{A}$ = 4i+2j−k and $\vec{B}$ = 2i−6i−3k then calculate a vector that is perpendicular to both $\vec{A}$ and $\vec{B}$
(A)-12$\hat{\imath}$ + 10 $\hat{\jmath}$ + 28$\hat{k}$ (B) -12$\hat{\imath}$ - 10 $\hat{\jmath}$ + 28$\hat{k}$ (C) 12$\hat{\imath}$ - 10 $\hat{\jmath}$ + 28$\hat{k}$ (D) -12$\hat{\imath}$ -10 $\hat{\jmath}$ + 28$\hat{k}$

30. If $\vec{A}$ x $\vec{B}$ = 0 and $\vec{B}$x $\vec{C}$ = 0, then the value of $\vec{A}$x $\vec{C}$ is
A.0 B. AC cosθ C. AB tanθ D. ACsinθ

31. If $\vec{A}$ x $\hat{\imath}$ =0 and $\vec{A}$ x $\hat{\jmath}$ = 0 then $\vec{A}$
A) is perpendicular to $\hat{\imath}$ x $\hat{\jmath}$ B) is parallel to $\hat{\imath}$ x $\hat{\jmath}$ C) is equal to $\hat{k}$ D)is equal to 0

32. The value of λ for which the two vectors 2$\hat{\imath}$ - $\hat{\jmath}$ + 2$\hat{k}$ and 3$\hat{\imath}$ + λ $\hat{\jmath}$ + $\hat{k}$ are perpendicular is
(A) 2 (B) 4 (C) 6 (D) 8

33. If $|\vec{A}|$ = 4 , $|\vec{B}|$ = 3, and $|\vec{A}$ x $\vec{B}|$ = 12, the value of $|\vec{A}\,.\,\vec{B}|$
(A) 5 (B) 10 (C) 14 (D) 16

34. The vectors $\lambda\,\hat{\imath} + \hat{\jmath} + \hat{k}$ ˆ,$\hat{\imath}$ + $\lambda\hat{\jmath}$ - $\hat{k}$ and 2$\hat{\imath}$ -$\hat{\jmath}$ + λ $\hat{k}$ are coplanar if
(A) λ = –2 (B) λ = 0 (C) λ = 1 (D) λ = – 1

35. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are three vectors such that $|\vec{a}|$ = 3, $|\vec{b}|$ = 4, $|\vec{c}|$ = 5 and $\vec{a}$, $\vec{b}$, $\vec{c}$ are perpendicular to $\vec{b}$ + $\vec{c}$, $\vec{a}$ + $\vec{c}$, $\vec{a}$ + $\vec{b}$ respectively, then $|\vec{a} + \vec{b} + \vec{c}|$ = _____
(A) $6\sqrt{2}$ (B) $3\sqrt{2}$ (C) $4\sqrt{2}$ (D) $5\sqrt{2}$

36. Let $\vec{u}$, $\vec{v}$, $\vec{w}$ three vectors such that $|\vec{u}|$ = 1, $|\vec{v}|$ = 2, $|\vec{w}|$ = 3. If the projection of $\vec{v}$ along $\vec{u}$ is equal to that of $\vec{w}$ along $\vec{u}$ and $\vec{v}$, $\vec{w}$ are perpendicular to each other ,then $|\vec{u} - \vec{v} + \vec{w}|$ equals
(A) $\sqrt{7}$ (B.) $\sqrt{14}$ (C) 14 (D) 2

37. Dot products of a vector with vectors 3$\hat{\imath}$ -5$\hat{k}$, 2$\hat{\imath}$ +7 $\hat{\jmath}$ and $\hat{\imath}$ + $\hat{\jmath}$ + $\hat{k}$ are respectively -1,6 and 5 respectively. What is the vector?
(A) 3$\hat{\imath}$ + $\hat{\jmath}$ + 2$\hat{k}$ (B)2$\hat{\imath}$ + 3$\hat{k}$ (C) 3$\hat{\imath}$ - 2$\hat{k}$ (D.) 3$\hat{\imath}$ + 2$\hat{k}$

38. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are three vectors such that $\vec{a}$ + $\vec{b}$ + $\vec{c}$ = 0 and $|\vec{a}|$ = 2, $|\vec{b}|$ = 3, $|\vec{c}|$ = 5 then value of $\vec{a}$. $\vec{b}$ + $\vec{b}$. $\vec{c}$ + $\vec{c}$. $\vec{a}$ is (A) 0 (B) 1 (C.) – 19 (D) 38

39. Which one of the following is ***false*** equation about unit vectors $\hat{\imath}$, $\hat{\jmath}$, $\hat{k}$?
A) $\hat{\imath}$ x $\hat{\jmath}$ = $\hat{k}$ B) $\hat{\jmath}$ x $\hat{k}$ = $\hat{\imath}$ C) $\hat{k}$ x $\hat{\imath}$ = -$\hat{\jmath}$ D) $\hat{\jmath}$ x $\hat{\jmath}$ = 0

40. If If $\vec{A}$ = (6.0i − 8.0j) units, $\vec{B}$ = (−8.0i + 3.0j) units, and $\vec{C}$ = (26.0i + 19.0j) units, what are the values of a and b so that a$\vec{A}$ + b$\vec{B}$ + $\vec{C}$= 0?
A. a = 5 ,b = 7 B) a = 7 ,b = 5 C) a = -5 ,b = -7 D) a = -7 ,b = -5

41. If a vector $\vec{P}$ making angles α, β , and γ respectively with the X, Y and Z axes respectively. Then $Sin^2_\alpha + Sin^2_\beta + Sin^2_\gamma$ =_____
(A) 1 (B)3 (C)2 (D)0

42. Two vectors $\vec{a}$ and $\vec{b}$ are at an angles of 60^0 with each other .Their resultant makes at angle of 45^0 with $\vec{a}$. If $|\vec{b}\,|$ = 2units then what is the value of $|\vec{a}|$?
A. ($\sqrt{3}$ + 1)units B. ($\sqrt{3}$ - 1)units C. $\sqrt{3}$ units D. (1 − $\sqrt{3}$)units

43. For any vector $\vec{a}$, the value of $(\vec{a}\,x\,\hat{\imath})^2 + (\vec{a}\,x\,\hat{\jmath})^2 + (\vec{a}\,x\,\hat{k}\,)^2$ is equal to
A) $\vec{a}^2$ (B)3$\vec{a}^2$ (C) 4$\vec{a}^2$ (D.) 2$\vec{a}^2$

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44. A vector $\vec{B}$, with a magnitude of 8.0 m, is added to a vector $\vec{A}$, which lies along an x axis. The sum of these two vectors is a third vector that lies along the y axis and has a magnitude that is twice the magnitude of $\vec{A}$ .What is the magnitude of $\vec{A}$?

(A.) $\frac{2}{\sqrt{5}}$ (B) $\frac{4}{\sqrt{5}}$ (C.) $\frac{8}{\sqrt{5}}$ (D) $\frac{16}{\sqrt{5}}$

45. If $\vec{a}$ is a unit vector the value of $|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2$ is equal to

(A.)2 (B)0 (C) 1 (D) 3

46. Which of the following is (are) ***correct*** (meaningful) vector expressions?

(A) $\vec{A} \times (\vec{B} \cdot \vec{C})$ (B) $5 + \vec{A}$ (C) $\vec{A} + (\vec{B} \times \vec{C})$ (D) $(\vec{A} \cdot \vec{B}) + (\vec{B} \times \vec{C})$

47. Which of the following is not true ? If $\vec{A} = 3\hat{\imath} + 4\hat{\jmath}$ and $\vec{B} = 6\hat{\imath} + 8\hat{\jmath}$ where $|\vec{A}|$ and $|\vec{B}|$ are the magnitudes of $\vec{A}$ and $\vec{B}$

(A) $\vec{A} \times \vec{B} = 0$ (B) $|\vec{A}| = 5$ (C) $\frac{|A|}{|\vec{B}|} = 0.5$ (D) $\vec{A} \cdot \vec{B} = 48$

48. Following sets of three forces act on a body. Whose resultant ***cannot*** be zero?

(A) 10, 10, 10 (B) 10, 10, 20 (C) 10, 20, 23 (D) 10, 20, 40

49. If $\vec{A} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $\vec{B} = -\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ then ***projection of $\vec{A}$ on $\vec{B}$*** will be

A. $\frac{3}{\sqrt{13}}$ B. $\frac{3}{\sqrt{26}}$ C. $\sqrt{\frac{3}{13}}$ D. $\sqrt{\frac{3}{26}}$

50. Which one of the following is ***false*** equation about unit vectors $\hat{\imath}$, $\hat{\jmath}$, $\hat{k}$?

A) $\hat{\imath} \times \hat{\jmath} = \hat{k}$ B) $\hat{\jmath} \times \hat{k} = \hat{\imath}$ C) $\hat{k} \times \hat{\imath} = -\hat{\jmath}$ D) $\hat{\jmath} \times \hat{\jmath} = 0$

51. For what value of m such that the vectors $\vec{A} = m\hat{\imath} + 5\hat{\jmath} - \hat{k}$ and $\vec{B} = m\,\hat{\imath} + m\hat{\jmath} + 6\hat{k}$ ***orthogonal*** to each other?

A.{6,1} B. {-6,-1} C.{-6,1} D. {6,-1}

52. What is the ***unit vector perpendicular*** to the following vectors $2\hat{\imath} + 2\hat{\jmath} - \hat{k}$ and $6\hat{\imath} + 3\hat{\jmath} + \hat{k}$?

A. $\frac{5\hat{\imath} + 8\hat{\jmath} - 6\hat{k}}{5\sqrt{5}}$ B. $\frac{5\hat{\imath} - 8\hat{\jmath} - 6\hat{k}}{5\sqrt{5}}$ C. $\frac{5\hat{\imath} - 8\hat{\jmath} + 6\hat{k}}{5\sqrt{5}}$ D. $\frac{-5\hat{\imath} - 8\hat{\jmath} - 6\hat{k}}{5\sqrt{5}}$

53. If $\vec{A} = 4\hat{\imath} - 3\hat{\jmath}$ and $\vec{B} = 6\hat{\imath} + 8\hat{\jmath}$ then magnitude and direction of $\vec{A} + \vec{B}$ will be

A. 5, $\tan^{-1}(3/4)$ B. $5\sqrt{5}$, $\tan^{-1}(1/2)$ C. 10, $\tan^{-1}(3/4)$ D. 25, $\tan^{-1}(5)$

54. For any vector $\vec{a}$, the value of $(\vec{a} \times \hat{\imath})^2 + (\vec{a} \times \hat{\jmath})^2 + (\vec{a} \times \hat{k})^2$ is equal to

(A) $\vec{a}^2$ (B)$3\vec{a}^2$ (C) $4\vec{a}^2$ (D) $2\vec{a}^2$

55. Two vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$. Then

A) $\vec{A} \times \vec{B} = 0$ B) $\vec{A} \cdot \vec{B} = 0$ C) $\vec{A} = 0$ D) $\vec{B} = 0$

56. The ***area of a triangle*** formed by $2\hat{\imath} + \hat{\jmath} - \hat{k}$ and $\hat{\imath} + \hat{\jmath} + \hat{k}$ is

A. $2\sqrt{3}$ square units B. $2\sqrt{14}$ square units C 3 square units D. $\frac{\sqrt{14}}{2}$ square units

57. Two vectors $\vec{P} = 2\hat{\imath} - \lambda\hat{\jmath} + 2\hat{k}$ and $\vec{Q} = \hat{\imath} + \hat{\jmath} + \hat{k}$ will be parallel if

(A) $\lambda = 2$ (B) $\lambda = 1$ (C) $\lambda = -2$ (D) $\lambda = -4$

58. If a vector $\vec{P}$ making angles α, β , and γ respectively with the X, Y and Z axes respectively. Then what are the value of $\mathbf{Cos}^2_\alpha + \mathbf{Cos}^2_\beta + \mathbf{Cos}^2_\gamma$ and $\mathbf{Sin}^2_\alpha + \mathbf{Sin}^2_\beta + \mathbf{Sin}^2_\gamma$ respectively?

(A) 1 , 1 (B)1 , 0 C) 1 , 2 (D)1 , 3

59. What is the value of $\vec{U} + \vec{V}$, if $\vec{U}$ is 6m due East, $\vec{V}$ is 10m at an angle of 60° below the horizontal?

(A) 12m (B) $\sqrt{14}$m (C) 14m (D) $14\sqrt{2}$m

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60. Which one of the following is ***correct*** statement?
   A. Dot Product of two-unit vectors is again a unit vector.
   B. Cross Product of two-unit vectors is again a unit vector.
   C. Dot Product of a vector with itself is equal to the square of its length.
   D. Cross Product of a vector with itself is equal to the square of the same vector

61. What is the value of $\vec{a} + \vec{b}$, if $\vec{a}$ is 4m due west, $\vec{b}$ is 8m at an angle of 60° below the horizontal?
   (A) 12m (B) $2\sqrt{13}$m (C) $4\sqrt{7}$m (D) $2\sqrt{7}$m

Answer questions 62-64 based on the information given below $\vec{A} = \begin{bmatrix}2\\3\\4\end{bmatrix}$, $\vec{B} = \begin{bmatrix}4\\5\\3\end{bmatrix}$ and $\vec{C}$ = -3i + 4j

62. What is the vector perpendicular to both $\vec{A}$ and $\vec{B}$?
   A. -11i – 10j + 2k B. -11i + 10j - 2k C. 8i – 10j + 4k D. 11i – 5j + 3k

63. What is the unit vector perpendicular to both $\vec{A}$ and $\vec{B}$?
   A. $\frac{-11}{15}$ i + $\frac{2}{3}$ j - $\frac{2}{15}$ k B) $\frac{-11}{15}$ i + $\frac{2}{15}$ j - $\frac{2}{15}$ k C) $\frac{-11}{15}$ i + $\frac{2}{3}$ j + $\frac{2}{15}$ k D) $\frac{-11}{15}$ i + $\frac{10}{15}$ j + $\frac{2}{15}$ k

64. If ℓ, m and n are the direction cosines of a vector, then
   A .ℓ + m+ n = 1 B. ℓ^2 +m^2 +n^2 = 1 C.1/ ℓ +1/m + 1/n = 1 D. ℓ m n =1

65. What is the angle b/n the z –axis and the vector i + j+.$\sqrt{2}$ k?
   A.30 ° B.45° C.60° D.90°

66. Which one of the following is false statement
   A . The area of a parallelogram formed by $\vec{A}$ and $\vec{B}$ is 15 square units
   B. The scalar projection of $\vec{B}$ onto $\vec{C}$ is $\frac{8}{5}$
   C. The volume of parallelepiped formed by $\vec{A}$, $\vec{B}$ and $\vec{C}$ is 73 cubic units
   D. The scalar product of $\vec{A}$ and $\vec{C}$ is 18

67. If $\vec{A}$ is perpendicular to $\vec{B}$ then
   A. $\vec{A}$.($\vec{A}$ + $\vec{B}$) = A^2 +AB B)$\vec{A}$. ($\vec{A}$ + $\vec{B}$) = A^2 C. $\vec{A}$ x $\vec{B}$ = 0 D. $\vec{A}$. $\vec{B}$ = AB

68. For any two vectors $\vec{A}$ and $\vec{B}$,if $\vec{A}$. $\vec{B}$ = $|\vec{A} \times \vec{B}|$ the magnitude of $\vec{C}$ =$\vec{A}$ + $\vec{B}$ is
   A. $\sqrt{A^2 + B^2}$ B. $\sqrt{A^2 + B^2 + \frac{AB}{\sqrt{2}}}$ C. A+B D. $\sqrt{A^2 + B^2 + \sqrt{2}AB}$

69. If a unit vector is represented by 0.5i + 0.8j +ck then the value of c is
   A.$\sqrt{0.01}$ B. $\sqrt{0.11}$ C. $\sqrt{0.8}$ D.1

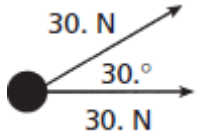
70. Which one of the following is vector quantity?
   A. Electric current B. Air resistance C. potential difference D. Charge

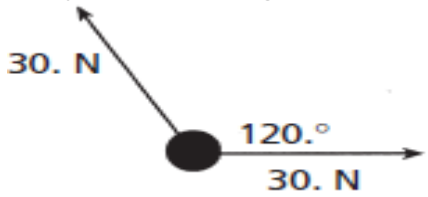
71. Which one of the following is ***false*** about two non zero vectors $\vec{A}$ and $\vec{B}$?
   A. If $\vec{A}$ is parallel to $\vec{B}$, then $\frac{\vec{A}.\vec{B}}{|\vec{A}||\vec{B}|}$ = 1
   B. If $\vec{A}$ is anti parallel to $\vec{B}$, then $\frac{\vec{A}.\vec{B}}{|\vec{A}||\vec{B}|}$ = -1
   C. If $\vec{A}$ perpendicular to $\vec{B}$, then $\frac{\vec{A}.\vec{B}}{|\vec{A}||\vec{B}|}$ = 0
   D. If $\vec{A}$ and $\vec{B}$ are collinear, then $\vec{A} \times \vec{B} \neq 0$

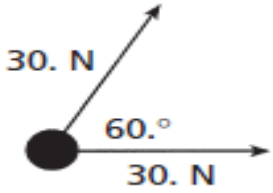
72. Which one of the following is ***incorrect*** about types of vectors?
   A. coplanar vectors are vectors that act in the same two-dimensional plane
   B. Collinear vectors are vectors limited to only one dimension
   C. Collinear vectors can be in the same direction or opposite directions.
   D. Position vector represents the position of an object in relation to another point with a length of one unit .

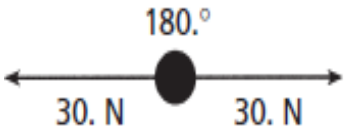
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73. Two 30.-newton forces act concurrently on an object. In which diagram would the forces produce a resultant with a magnitude of 30. newtons?

A. 

B. 

C. 

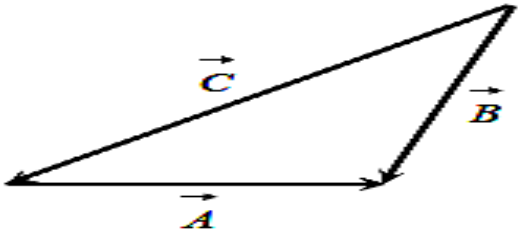
D. 

74. Which one of the following is incorrect about vectors?

A. A quantity having magnitude and direction is necessarily a vector.
B. The minimum value of the resultant of two vectors is equal to the difference of their magnitude.
C. The maximum value of the resultant of two vectors is equal to the sum of their magnitude.
D. The resultant of two vectors of unequal magnitude can never be a null vector.

75. For the figure

(A) $\vec{A} + \vec{B} = \vec{C}$
(B) $\vec{B} + \vec{C} = \vec{A}$
(C) $\vec{C} + \vec{A} = \vec{B}$
(D) $\vec{A} + \vec{B} + \vec{C} = 0$



76. The angle between two vectors given by 6i + 6 j - 3k and 7i + 4 j +4k is

A. $cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ B. $cos^{-1}\left(\frac{5}{\sqrt{3}}\right)$ C. $sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$ D. $sin^{-1}\left(\frac{5}{\sqrt{3}}\right)$

77. The magnitudes of two vectors $\vec{A}$ and $\vec{B}$ are $|\vec{A}| = 12$ units and $|\vec{B}| = 8$ units. Which of the following pairs of numbers represents the largest and smallest possible values for the magnitude of the resultant vector $R = \vec{A} + \vec{B}$?

(a) 14.4 units, 4 units (b) 12 units, 8 units (c) 20 units, 4 units (d) 96units, 1.33units

78. If vector B is added to vector A, which two of the following choices must be true in order for the resultant vector to be equal to zero?

(a) A and B are parallel and in the same direction.
(b) A and B are parallel and in opposite directions.
(c) A and B have the same magnitude.
(d) A and B are perpendicular.

79. If vector B is added to vector A, under what condition does the resultant vector have $\vec{A} + \vec{B}$ magnitude $|\vec{A}| + |\vec{B}|$?

(a) $\vec{A}$ and $\vec{B}$ are parallel and in the same direction. (c) $\vec{A}$ and $\vec{B}$ are perpendicular
(b) $\vec{A}$ and $\vec{B}$ are parallel and in opposite directions. (d) $\vec{A}$ and $\vec{B}$ are inclined at 120^0

80. A car travels 20.0 km due north and then 35.0 km in a direction 60^0 west of north, the magnitude of the car's resultant displacement is

A. 45km B) 15km C)55km D)48km

81. If $\vec{A} + \vec{B} = 0$, the corresponding components of the two vectors $\vec{A}$ and $\vec{B}$ must be

(a) equal (b) positive (c) negative (d) of opposite sign

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UNIT 3 KINEMATICS

Part one 2002E.C EUEE = 7

1. An athlete accelerates 1.9m/s^2 for 2.2sec at the beginning of a race. What is rhe speed of the athelete at the end of a 300m race?

   A. 0. 86m/s B. 1.16m/s C) 4.18m/s D. 9.20m/s

2. A body is rotating with a uniform speed of in a circle of radius 1m. What is the centripetal acceleration in m/s^2 if it completes 12 rotations in 3 seconds.

   A.36π^2 B) 64π^2 C. 72π^2 D. 144π^2

3. If a car moves around a circular road of radius r at a constant speed.
   A. Its velocity changes and its acceleration is V/r^2
   B. There is no force on the car since the speed is constant
   C. There is no velocity change since the speed is constant
   D.. The force per unit mass on the car is towards the center and is $\frac{v^2}{r}$

4. A car with an initial speed of 4m/s starts accelerating in a straight line at 3.2m/s^2 for 10 seconds. If the brakes are then applied and it travels a further 20m before ,what is its acceleration?
   A. -48.6 B. 16.2 C. -8.1 D) -32.4

5. A ball rolls off the edge of the horizontal table top 4m high. .It strikes the floor at a point 5m horizontally away from the edge of the table. How long was the ball in the air in seconds?

   A. $\frac{3}{\sqrt{5}}$ B. $\frac{1}{\sqrt{5}}$ C. $\frac{2}{\sqrt{3}}$ D. $\frac{2}{\sqrt{5}}$

6. A boat is travelling at 15km/h with respect to the water of a river in the upstream direction . .The water itself is flowing at 6km/h with respect ot the ground .A child on the boat walks form rear seat to front seat at 5km/h with respect to the boat. What is the velocities of the boat. What are the velocities of the boat and the child in km/h with respect to the ground respectively?

   A. 6 , 12 B. 21 ,12 C. 5 , 9 D.. 9 , 14

7. In a 100m race Usain Bolt and Assefa Powel cross the finish line in a dead beat, both taking 10s .Accelerating uniformly , Usain Bolt takes 3s and Assefa Powel took 2s to to attain maximum speed which they maintained for the rest of the race. What was the acceleration of Usain Bolt and Assefa Powel respectively ?

   A. 4.32 m/s^2 , 2.25 m/s^2 B. 4.92 m/s^2 , 6.45 m/s^2

   C) 3.92 m/s^2 ,5.55 m/s^2 D. 4.92 m/s^2 , 5.35 m/s^2

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Part two 2003E.C EUEE = 7

8. Uniform circular motion is a

   A. Motion with constant velocity B. motion in which net force is constant

   C. motion in one dimension D.. motion with acceleration of constant magnitude.

9. An object of mass m moving with an initial speed of 15m/s got an acceleration of 10 m/s^2 after a constant force F applied to it. How long does it take for an object to reach 90 meteres from its initial position?

   A. 3.22s B. 0.75sec C) 3s D. 2.5sec

10. When a small mass m is suspended from one end of a vertical string and then whirled in a horizontal circle at a constant speed V ,

    A. The strings stays vertical

    B.. the string becomes inclined to the vertical

    C. there is no force on m except its weight

    D. The angle of inclination to the vertical of the string does not depend on V

11. A ball is thrown dawn ward (not dropped) form the top of a tower .After being released ,its dawn ward ,

    A. Velocity will be uniform B.. acceleration will be equal to g

    C. acceleration will be greater than g D. acceleration will be smaller than g

12. A car initially at rest at the origin has moved a distance of 5 , 10 ,15 , 20 ,25, 30 ,40 ,50 , 60,70 meters during the 1 , 2 , 3 ……10 seconds respectively .What is the average speed during the first 5 seconds and the second half period from t = 6sec to t = 10sec in m/s respectively.

    A. 4 ,10 B. 4 ,9 C.. 5 ,9 D. 5 ,10

13. A small car and a bus move with velocities given by $\vec{V}_c$ = (3i-2j)m/s and $\vec{V}_b$ = (-5i – 4j)m/s respectively according to the observer on the ground . What is the velocity of the bus according to a car driver ?

    A. (-2i +6j)m/s B(-2i-6j)m/s C. (-8i + 2j)m/s D... (-8i-2j)m/s

14. The X and Y coordinates of a particle at any time t is given by X = 9t + $5t^2$ and Y =5t + 8 where x and y are in meters and t in seconds .The acceleration of the particle at t = 5 sec is

    A. zero B. 10m/s^2 C. 14 m/s^2 D.20m/s^2

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Part three 2004E.C EUEE = 4

15. A projectile is fired at 60^0 with the horizontal . At the highest point of its path, the vertical component of its velocity is momentarily zero. What is the magnitude of its acceleration at this point?

A. 20 m/s^2 B... 10 m/s^2 C. 5 m/s^2 D. 0 m/s^2

16. A cart on air track is moving at 0.5m/s when the air is suddenly turned off. The cart comes to rest after travelling 1m. The experiment is repeated , but the cart is moving at 1m/s when the air is turned off .How far does the cart travel before coming to rest?

A. 1m B. 2m C. 3m D... 4m

17. A car accelerates steadily from 0m/s to 30m/s in a distance d and a time t .Another car takes a time 3t to accelerates steadily from stationary to the same final velocity. What distance does the second car cover during the new acceleration?

A. d B. $\frac{d}{3}$ C. . $\frac{d}{3}$ D... 3d

18. An object moving with uniform acceleration has a velocity of 12m/s in the positive x direction when its x coordinate is 3cm .In its x coordinate 2sec later is -5 cm .what is its acceleration?

A... -12m/s^2 B.-13 m/s^2 C. -16 m/s^2 D.12m/s^2

Part four 2005E.C EUEE = 5

19. The coordinate of the a particle in meters is given by x(t) = 25t - 3t^3, where t in seconds .At what value of t will the particle momentarily at rest?

A. 2.78s B. 1.67s C. 0.6s D. 0.36s

20. A women deriving a 2000kg car along a level road at 30m/s takes her foot off the gas to see how far her car will roll before it slows to a stop .She covers that it takes 150m. .What is the average force of friction acting on the car?

A. 9000N B. 6000N C. 3000N D. 400N

21. A deriver moving at a constant speed of 20m/s sees an accident up a head and hits the brakes .If the car decelerates at a constant arte of -5 m/s^2 ,how far does the car go before it comes to a stop?

A. 120m B. 100m C. 40m D. 20m

22. The planet Jupiter is about 318 times as massive as Earth, yet on its surface you would weigh only about 2.4 times your weight on Earth. Why is this happened?

A. Your mass is 132.5 times less on Jupiter

B. you are 132.5 times more weightless there

C. Jupiter is significantly farther from the sun.

D. Jupiter's radius is about 11.5 times on the earth's surface

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23. A rocket moving in free space has a speed of 3 x 10^3 m/s relative to the Earth .Its engine are turned on , and fuel is ejected in a direction opposite the rockets motion at a speed of 5 x 10^3 m/s relative to the rocket . What is the speed of the rocket relative to the earth once the rocket 's mass is reduced to half before ignition?

A. 7 x 10^3 m/s B. 4 x 10^3 m/s C. 2 x 10^3 m/s D. 5 x 10^3 m/s

Part five 2006E.C EUEE = 4

24. Which one of the following statements is true about the motion of a particle in a circular path?

A. the centripetal acceleration is constant if the particle's speed is constant

B. The tangential acceleration can be perpendicular to the velocity vector of the particle

C. The centripetal acceleration is always in the direction perpendicular to the velocity vector of the particle

D. The acceleration is always perpendicular to the velocity vector of the particle

25. A boy moving with constant acceleration covers the distance between two pints 60m apart in 5sec . Its velocity as it passes the second point is 15m/ s. What is the acceleration?

A.3 m/s^2 B. 2.4 m/s^2 C. 1.8 m/s^2 D. 1.2 m/s^2

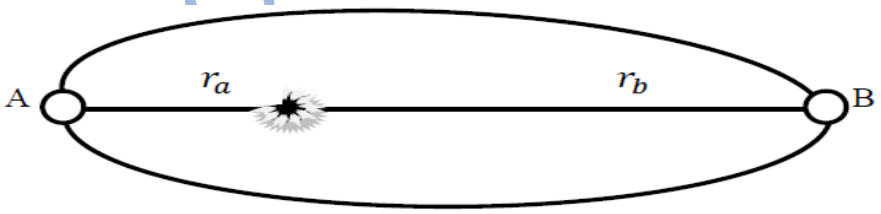
26. A plane of mass m is circling a star in an elliptical orbit as shown below. If its velocity at point A is 60,000m/s and $r_b = 8r_a$ what is its velocity at point B?

A. 7500m/s

B. 8571m/s

C. 60,000m/s

D. 488,000m/s



27. Two projectiles are fired from ground level at equal speed but different angles . One is fired at an angle of 30 degrees and the other at an angle of 60 degrees .T he projectile to hit the ground first will be the one fired at (neglect air resistance?

A. 60 degrees B. 30 degrees C. both hit at same time D. can't be determined

Part six 2007E.C EUEE = 4

28. A woman is rotating a bucket of water in a vertical circle of radius 0.9m .The mass of the bucket t and water is 5kg. What s the bucket's minimum speed at the top of the circle If no water is to spill out?

A. 0 B. 1m/s C. 3 m/s D. 9 m/s

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29. Which one of the following statements is correct?

A. An object moving toward the east cannot have an acceleration toward the west.

B. Ife the average velocity of an object is zero in some time interval, the average speed of the object fore that time interval is zero.

C. The velocity – time graph of an object moving with constant acceleration is parallel to the time axis.

D. An object having zero velocity can have acceleration different from zero.

30. A car travels along a straight line at a constant speed of 20 m/s for a distance d and then another distance d in the same direction at a constant speed of 36 k/hr. What is the average speed for the entire ?

A. 23 km/h B. 48 km/h C. 54 km/h D. 60 km/h

31. If a long distance jumper athlete leaves the ground at an angle of 37.0° above the horizontal surface ate a speed of 10.0 m/s, how far does he jump in the horizontal direction?

A. 48 m B. 6m C. 9.6 m D. 12 m

Part seven 2008E.C EUEE = 4

32. An example of a body moving with constant speed but still accelerating is

A. A body moving on a straight road C. A body moving on a straight railway track

B. A body moving in a circular path D. A body Falling in a viscous fluid

33. A man is standing on a spring scale in an elevator. When the elevator is at rest, the scale reads 600N. the elevator has:

A. An upward acceleration. B. A constant downward speed.

C. A constant upward speed. D. Downward acceleration.

Part eight 2009E.C EUEE = 2

34. A cricketer throws a ball vertically upwards with initial speed of 20m/s. how long is it in the air before it returns to the cricketer's hands?

A. 2 s B.10 s C. 1.5 s D. 4 s

35. A fun making boy swings a blinking ball tied to the end of a string in a vertical circle. If the radius of the circle is 0.5m, then what should be the minimum speed of the ball at the bottom of the circle to make a complete circular motion at the top?

A. 5m/s B.$\sqrt{5}$m/s C. $\sqrt{15}$m/s D. $2\sqrt{5}$m/s

Part nine 2010E.C EUEE = 4

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36. A race car is moving at a constant speed of 35m/s a security car was moving at a speed of 5m/s as a race car passes by it and was accelerating at constant rate of $5m/s^2$. What was the speed of the security car when it took over the race car?

A. 35m/s B.60m/s C.65m/s D.5m/s

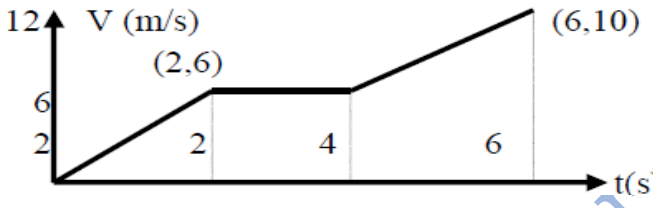
37. A car starts moving from rest and its motion on a straight line is shown in the figure below. What is the average velocity of the car within the first 6 seconds?

A. 1.67m/s

B. 5.67m/s

C. 5m/s

D. 6m/s



38. Which one of the following statements is correct regarding the motion in a plane?

A. When a body moves in a horizontal circle, its velocity is constant.

B. When a body moves in a vertical circle, its speed is constant.

C. In projectile motion the horizontal component of the motion is uniformly accelerated motion.

D. The centripetal force for a body moving in either vertical or horizontal circle is toward the center

39. A satellite moves at a constant speed in a circular orbit about the center of the earth at an altitude half the radius of the earth above its surface. If g is gravitational acceleration at the surface of the earth and R its radius, than what are the speeds of the satellite?

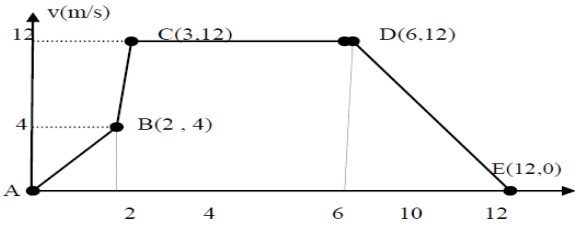
A. $\sqrt{3gR/2}$ B. $\sqrt{2gR}$ C. $\sqrt{gR}$ D. $\sqrt{2gR/3}$

Part ten 2011E.C EUEE = 5

40. A drivers of an automobile travelling at a constant speed of 20m/s suddenly applies a brake and the automobiles comes to rest in 2.0 seconds after skidding for skidding for a certain distance. What is the length of the skid distance?

A. 400m B. 10m C. 40m D.20m

41. Which of the following is correct about the motion shown in the velocity – time graph below



A. Between C and D motion is with constant acceleration.

B. Between B and C the acceleration is $4m/s^2$

C. Between D and E the motion is with constant +ve acceleration

D. Total displacement is 84m

42. An object of mass M is set in a circular motion. the tension T from the rope keeps the object in a circular path with speed v. where does the rope experience a maximum tension?

A. At the top of the circle C. At the bottom of the circle

B. When the object is at half of the circle D. When it is at 45^0 to the vertical line

43. A shall is fired from a gun, whose barrel is inclined at an angle to the horizontal during the flight the shell explodes in air into fragments. The center of mass of different fragments will follow

A. A horizontal straight line C. A vertical straight line

B. A parabola D. An unpredictable path

44. A trolley is set to move on a smooth track that is banked at an angle of 30^0. For a trolley moving with a speed 5m/s to round the curve, what is radius of the banked surface?

A. 5.0m B.2.5m C. 10m D. 3.5m

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2012E.C EUEE = 4

45. A position vector of an object
    A. A measure of how fast it is moving relative to stationery reference frame.
    B. Is independent of the origin from which it is measured
    C. Describes its distance from a given point in all direction
    D. Describes its distance from a given point in all direction

46. While going to school, a student travels 3km ,East and then 4 km ,North in 2 hrs. The magnitude of student's average velocity and average speed are respectively
    A. 2km/hr and 7km/hr
    B. 3.5km/hr and 2.5km/hr
    C. 2.5km/hr and 3.5 km/hr
    D. 5km/hr and 7km/hr

47. In an experiment to measure the velocity of a ball rolling along x-axis , student recorded the distance traveled and time taken by the ball .Which of the following data represent constant velocity of the ball?

A.

x(m)	0	2	4	6	8	10
t(s)	0	1	2	3	4	5

B.

x(m)	0	2	3	4	6	7
t(s)	0	1	2	2.5	3	4

C.

x(m)	0	4	5	6	7	9
t(s)	0	1	2	3	4	4

D.

x(m)	0	3	5	6	7	9
t(s)	0	1	2	3	4	5

48. A boy throws a ball vertically upward with an initial velocity of 20m/s .Neglecting air resistance , which of the following is true about the motion of the ball?
    A. Its velocity after 3s is 50m/s , downward
    B. Its velocity after 1s is 30m/s , upward
    C. The time taken to reach the maximum height is 4s
    D. It maximum height is 20m/s

49. Choose the correct statement about centripetal force and centripetal acceleration?
    A. Centripetal acceleration and centripetal force are constant in direction but vary in magnitude.
    B. For an object moving in a circular path ,its centripetal force and Centripetal acceleration are parallel and directed towards the center of the path .
    C. Centripetal force on an object moving in a circular path tends to pull the object outward from its path.
    D. Centripetal force on an object moving in a circular path is perpendicular to the radius of the path.

2013/ 2014E.C EUEE = 4

50. Instantaneous velocity is different from average velocity in that; Instantaneous velocity is
    A. The velocity at a particular instant of time of time.
    B.in opposite direction to the displacement of the moving object.
    C. the total displacement to the time taken
    D. the average velocity during the time of the acceleration

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51. A bullet of 200g mass fired from a 30.0m high building, horizontally. At the same time a bullet of the same mass fired vertically dawn form the same height. What can be concluded about the motion of the two bullets?
    A. A bullet fired vertically takes more time to strike the ground.
    B. Both bullets move with the same horizontal velocity
    C. Both bullets strike the ground at the same time.
    D. A bullet fired horizontally takes more time to strike the ground

52. A car travelling at 20m/s starts to speedup. After 5 minutes its speed if 144m/s. What is the acceleration of the car?
    A. 28.8m/s B. 0.41m/s C. 24.8m/s D. 0.55m/s

53. A bird flies at a speed of 10m/s to south relative the Earth. A wind blows at speed of 4m/s to East relative to the Earth. What is the speed of the bird relative to the Earth?
    A. 6m/s in the direction of North- East C.10.8m/s in the direction of North- West
    B. 6m/s in the direction of South- East D. 10.8m/s in the direction of South- West

Self – Test Exercise

_____**1)** The acceleration of a moving body can be found from:
(a) area under velocity-time graph (b) area under distance-time graph
(c) slope of the velocity-time graph (d) slope of the distance-time graph

_____**2)** An object is thrown along a direction inclined at an angle 45° with the horizontal. The horizontal range of the object is
(a) vertical height (b) twice the vertical height
(c) thrice the vertical height (d) four times the vertical height

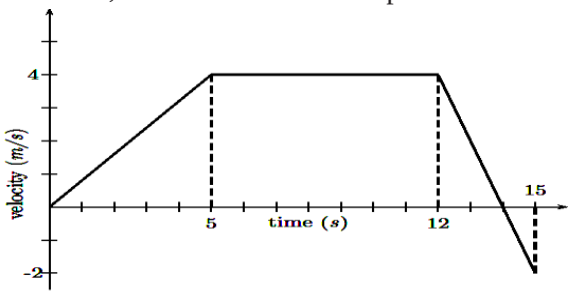
_____**3)** A bullet is fired upwards from the top of a tower with a velocity of 50 m/s making an angle of 30º with the horizontal. The height of the tower is 70 m. The time taken by the bullet to strike the ground is —
A. 7 s B. 5 s C. 9 s D. 2 s

_____**4)** An object moves along the *x* axis according to the equation $\boldsymbol{x(t) = (3t^2 - 2t + 3)\ m}$. What is the instantaneous acceleration at $t = 3.00$ s.
A. $18 m/s^2$ B. $6 m/s^2$ C. $3m/s^2$ D. $27 m/s^2$

_____**5)** How much the force of attraction between two bodies, each of mass 300 kg and 3m apart on the surface of the Earth? (Use $G = 6.67 \times 10^{-11} Nm^2/Kg^2$)
A. 6.67×10^{-6} N B. -6.67×10^{-6} N C. -6.67×10^{-7} N D. 6.67×10^{-7}N

_____**6)** Again consider question # 5 , What Will be the force of attraction , if the same bodies are placed on the moon, keeping the separation same?
A. smaller than before B. greater than before
C. the same as before D. hard to explain

_____**7)** The velocity-time graph of a car is plotted below. Calculate the displacement of the car has after 15 seconds?



A.41m
B.42m
C.28m
D.39m

_____**8)** .A turtle and a rabbit engage in a footrace over a distance of 4.00 km. The rabbit runs 0.500 km and then stops for a 90.0-min nap. Upon awakening, he remembers the race and runs twice as fast. Finishing the course in a total time of 1.75 h, the rabbit wins the race .What was his average speed before he stopped for a nap?
A. 9Km/h B. 4Km/h C. 1.25Km/h D. None

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_____**9)** The position of a particle varies with time t as $X = (at^2 - bt^3)$m .The acceleration at time of the particle will be equal to zero , where t is equal to

A. $^{2a}/_{3b}$ B. $^{a}/_{b}$ C. $^{a}/_{3b}$ D. zero

_____**10)** A body moving in the positive x direction passes the origin at time t = 0. Between t = 0 and t = 1 second, the body has a constant speed of 24 meters per second. At t = 1 second, the body is given a constant acceleration of 6 meters per second squared in the negative x direction. The position x of the body at t = 11 seconds is

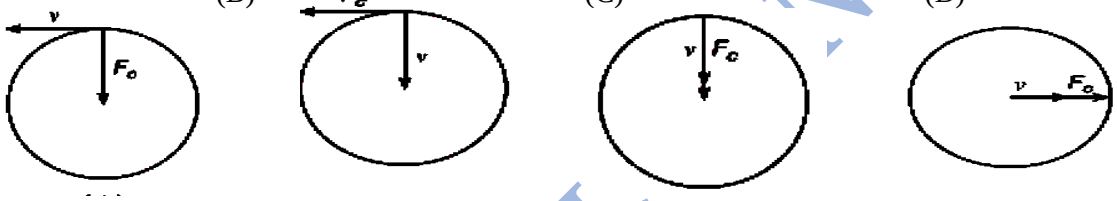
(A) + 99m (B) + 36m (C) – 36 m (D) – 75 m (E) – 99 m

_____**11)** Two forces of magnitude F have a resultant of the same magnitude F. The angle between the two forces is

A. 60^0 B. 120^0 C. 90^0 D. 45^0

_____**12)** A 1.0 x 10^3 kilogram car travels at a constant speed of 20 meters per second around a horizontal circular track. Which diagram correctly represents the direction of the car's velocity (v) and the direction of the centripetal force (Fc) acting on the car at one particular moment?

(A) (B) (C) (D)



_____**13)** A 2 kg rock swings in a vertical circle of radius 8 m . The speed of the rock as it passes its lowest point is 10 m/s . What is tension in the rope?

A. 45N B.5N C.25N D.20N

_____**14)** A stone is tied to a string and whirled in a vertical circle at a radius. Which of the following cannot be true?

(A) The string is most likely to break at the bottom of the circle.
(B) The tension force is the same everywhere in the circle.
(C) The tension force and the weight of the stone always affect the centripetal force.
(D) The tension is the least when the stone is at the top of the circle.

_____**15)** A stone of mass 1kg is tied to a string 4m long and is rotated at constant speed of 40m/s in a vertical circle .The ratio of the tension at the top to the bottom is

A. 11 : 12 B. 39 : 41 C.41 : 39 D. 12 : 11

_____**16)** A coin placed 30.0 cm from the center of a rotating, horizontal turntable slips when its speed is 50.0 cm/s. What is the coefficient of static friction between coin and turntable?

A. 0.05 B. 0.6 C. 0.08 D.0.8

_____**17)** When applying the equations of kinematics for an object moving in one dimension, which of the following statements must be true?

(A) The velocity of the object must remain constant.
(B) The acceleration of the object must remain constant.
(C) The velocity of the object must increase with time.
(D) The position of the object must increase with time.

_____**18)** Which one of the following is false statement about projectile motion?

A)The horizontal component of a velocity of a projectile is constant at all points .
B)At the maximum height of the projectile, both velocity and acceleration are zero.
C)An object can accelerate if its speed is constant
D) When a baseball is thrown with an initial velocity of (10**i** + 15**j**) m/s , its velocity at the top of its trajectory equals to 10**i** m/s

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_____**19)** An object moves along the x axis according to the equation x(t) = ($3t^2$ - 2t + 3) m. Which one is false?

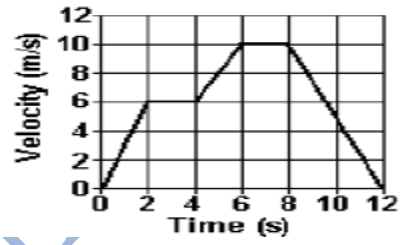
(A) the average speed between t = 2.00 s and t = 3.00s is 11m/s
(B) the instantaneous speed at t = 3.00 s, is 16m/s
(C) the average acceleration between t = 2.00s and t= 4.00s is 12m/s^2
(D) the instantaneous acceleration at t = 3.00 s is 6m/s^2

_____**20)** A projectile is fired in such a way that its horizontal range is equal to three times its maximum height. What is the angle of projection?

A. 60° B . 53° C. 37° D. 120°

The motion of a circus clown on a unicycle moving in a straight line is shown in the graph below

Questions 20 – 21



_____**21)** What would be the acceleration of the clown at 5 s?

(A) 1.6 m/s^2 (B) 8.0 m/s
(C) 2.0 m/s^2 (D) none of the above

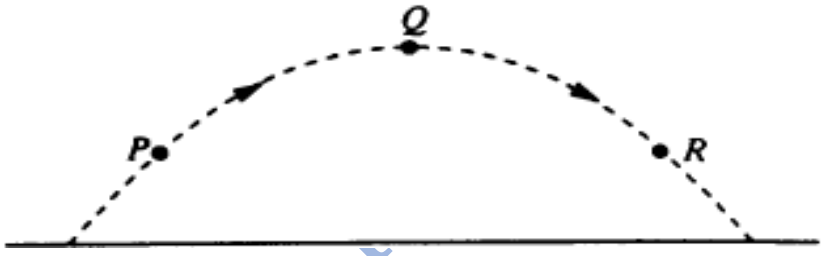
_____**22)** After 12 seconds, how far is the clown from her original starting point?

(A) 0 m (B) 10 m (C) 34 m (D) 47 m (E) 74m

_____**23)** A car travels 30 miles at an average speed of 60 miles per hour and then 30 miles at an average speed of 30miles per hour. The average speed the car over the 60 miles is

(A)35 m.p.h. (B) 40 m.p.h. (C) 45 m.p.h. (D) 10 m.p.h.

Questions 24 – 25

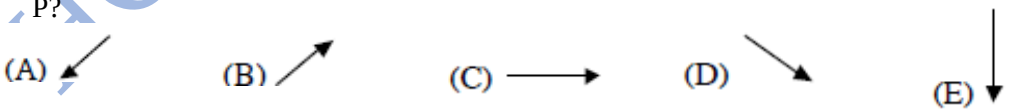


_____**24)** A ball is thrown and follows the parabolic path shown above. Air friction is negligible. Point Q is the highest point on the path. Points P and R are the same height above the ground.

How do the horizontal speeds of the ball at the three points compare?

(A) $V_P < V_Q < V_R$ (B) $V_R < V_Q < V_P$
(C) $V_Q < V_R < V_P$ (D) $V_Q = V_P = V_R$

_____**25)** Which of the following diagrams best shows the direction of the acceleration of the ball at point P?



_____**26)** A 0.400-kg object attached to the end of a string of length 0.500 m is swung in a circular path and in a vertical plane. If a constant angular speed of 8.00 rad/s is maintained, what is the tension in the string when the object is at the top of the circular path?

(a) 8.88 N (b) 10.5 N (c) 12.8 N (d) 19.6 N

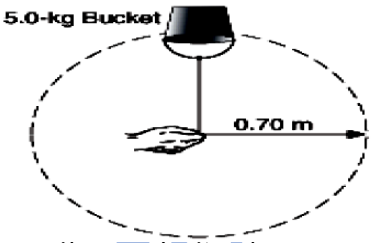
_____**27)** Wchich one of the following is ***false*** statement?

A. radial acceleration acts towards the centre of the particle is moving in a circle

B. tangential acceleration occurs when a particle is moving in circular motion, the component of a particle's acceleration at a tangent to the circle

C. centripetal force the force acting on a body moving in a circle which is directed towards the center of the circle

D. When a body is moving in a horizontal circle, the direction of the ve



_____**28)** The diagram below shows a 5.0 kilogram bucket of water being swung in a horizontal circle of 0.70meter radius at a constant speed of 2.0meters per second. The magnitude of centripetal force on the bucket of water is approximately

(A) 5.7 N (B) 29 N (C) 14 N (D) 200 N

_____**29)** A string 0.5m long is used to whirl a 1kg stone in a vertical circle at a uniform velocity of 5m/sec. What is the tension in the string when the stone is at the top and bottom of the circle respectively ?

A.40N ,50N B.40N , 60N C.60N , 40N D.50N ,40N

_____**30)** A toy car moves around a loop-the-loop track. The loop is 0.1m high. What is the minimum speed of the car at the top of the loop for it to stay on the track? (use g= 9.8m/s^2)

A. 7m/s B. 0.7m/s C. 0.07m/s D.1m/s

_____**31)** Which one is ***false*** about a body moves around in a ***vertical circle***?

A. At the top of the circle, the centripetal force and force from gravity are acting in the same direction,

B. At the bottom centripetal force and force from gravity are acting in opposite directions.

C. . when a body moves in a vertical circle, the speed does not stay constant

D. Its speed decreases as the body moves towards the bottom of the circle.

36. The velocity of a bullet is reduced from 200m/s to 100m/s while travelling through a wooden block of thickness 10cm. The ***retardation***, assuming it to be uniform, will be

(A) 10 x 10^4 m/s^2 (B) 12 x 10^4 m/s^2 (C) 13.5x 10^4 m/s^2 (D) 15 x10^4 m/s^2

37. A child whirls a ball at the end of a rope, in a uniform circular motion. Which of the following statements is **NOT** true?

(A) The speed of the ball is constant

(B) The velocity is of the ball is constant

(C) The magnitude of the ball's acceleration is constant

(D) The acceleration of the ball is directed radially inwards towards the center

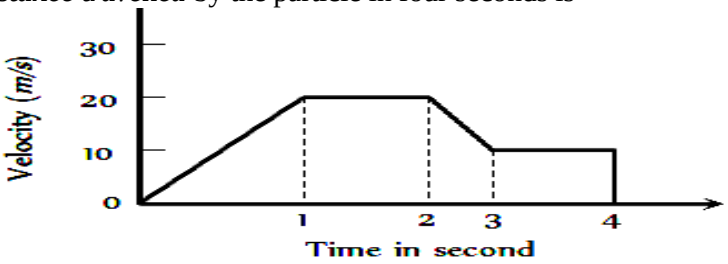
38. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The ***distance travelled*** by the particle in four seconds is

A) 60m

B)55m

C)25m

D)30m



39. A ball of mass 0.25 kg attached to the end of a string of length 1.96m is moving in a horizontal circle. The string will break if the tension is more than 25 N. What is the maximum speed with which the ball can be moved?

(A) 14 m/s (B) 3 m/s (C) 3.92 m/s (D) 5 m/s

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40. A vehicle travels half the distance d with speed V_1 and the other half with speed V_2, then its ***average speed*** is

A. $\frac{V_1+V_2}{2}$ B. $\frac{2V_1+V_2}{V_1+V_2}$ C. $\frac{2V_1V_2}{V_1+V_2}$ D. $\frac{d(V_1+V_2)}{V_1V_2}$

41. A toy car moves around a loop-the-loop track. The loop is 0.1m high. What is the minimum speed of the car at the top of the loop for it to stay on the track?(use g= 9.8m/s^2)

A. 7m/s B. 0.7m/s C. 0.07m/s D.1m/s

42. A student is riding a bicycle at a velocity of 4 m/s. The bicycle's wheels have a diameter of 0.8 m. What is the centripetal acceleration of a point on the rim of the wheel?

A) 0.4m/s^2 B) 10m/s^2 C) 40m/s^2 D) 4m/s^2

43. A particle is projected from the surface of the earth with a speed of 20 m/s at an angle 30º with the horizontal. What are the ***range***, ***hmax*** and ***total time of flight*** respectively?

(Use g = 10m/s^2 , sin30° = cos60° = 0.5 , sin60° = cos30° = $\frac{\sqrt{3}}{2}$)?

(A) $2\sqrt{3}$ m , 5m, 2sec (B) $20\sqrt{3}$ m , 0.5m, 2sec (C) $20\sqrt{3}$ m , 5m, 2sec (D) $20\sqrt{3}$ m , 5m, 1sec

44. A body of mass 100g is attached to the a 1m long string and it is revolving in a vertical circle .When the string makes an angle of 60^0 with the vertical then its speed is 2m/s. What is the tension in the string at $\theta = 60^0$?(Take cos60° = 0.5)

(A) 89N (B) 0.89N (C) 0.089N (D)8.9N

45. Which one of the following is incorrect statement?

A. Velocity of a particle having uniform motion = slope of displacement–time graph.
B. Greater the slope of displacement-time graph, smaller is the velocity
C. Area under v – t graph = displacement of the particle.
D. Slope of velocity-time graph = acceleration.

46. A person travels along a straight road for half the distance with velocity v_1 and the remaining half distance with velocity v_2 The average velocity is given by

A. v_1v_2 B. $\frac{v_1+v_2}{2}$ C. $\frac{V_2^2}{V_1^2}$ D. $\frac{2v_1v_2}{v_1+v_2}$

47. The correct statement from the following is

(A) A body having zero velocity will not necessarily have zero acceleration
(B) A body having zero velocity will necessarily have zero acceleration
(C) A body having uniform speed can have only uniform acceleration
(D) A body having non-uniform velocity will have zero acceleration

48. If a car covers $\left(\frac{2}{5}\right)^{th}$ of the total distance with V_1 speed and $\left(\frac{3}{5}\right)^{th}$ distance with V_2 then average speed is

A.$\frac{1}{2}\sqrt{v_1v_2}$ B. $\frac{v_1+v_2}{2}$ C. $\frac{2v_1v_2}{v_1+v_2}$ D. $\frac{5v_1v_2}{3v_1+2v_2}$

49. A thief is running away on a straight road in jeep moving with a speed of 9 m/s .A police man chases him on a motor cycle moving at a speed of 10 m/s. If the instantaneous separation of the jeep from the motorcycle is 100 m, how long will it take for the police to catch the thief

(A) 1 s (B) 19 s (C) 90 s (D) 100 s

50. The velocity of a bullet is reduced from 200m/s to 100m/s while travelling through a wooden block of thickness 10cm. The retardation, assuming it to be uniform, will be

(a) 10 x 10^4 m/s^2 (b) 12 x 10^4 m/s^2 (c) 13.5x 10^4 m/s^2 (d) 15 x10^4 m/s^2

51. A constant force acts on a body of mass 0.9 kg at rest for 10s. If the body moves a distance of 250 m, the magnitude of the force is

(a) 3N (b) 3.5N (c) 4.0N (d) 4.5N

52. The relation 3t = $\sqrt{3x}$ + 6 describes the displacement of a particle in one direction where x is in meters and t in sec. The displacement, when velocity is zero, is

(A)24 meters (B) 12 meters (C) 5 meters (D) Zero

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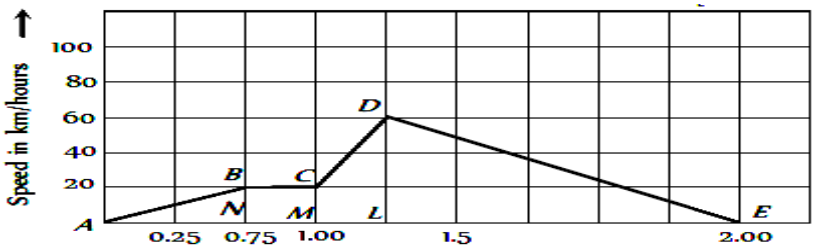
53. A train moves from one station to another in 2 hours time. Its speed-time graph during this motion is shown in the figure. The maximum acceleration during the journey is

(A)140 km/ h^2

(B) 160 km /h^2

(C) 100 km/ h^2

(D) 120 km/ h^2



54. The initial velocity of a body moving along a straight line is 7 m / s . It has a uniform acceleration of 4 m / s^2 . The distance covered by the body in the 5th second of its motion is

(A) 25 m (B) 35 m (C) 50 m (D) 85 m

55. If a cycle wheel of radius 4 m completes one revolution in two seconds. Then acceleration of a point on the cycle wheel will be

(A)$\pi^2 m/s^2$ (B)$2\pi^2 m/s^2$ (C)$4\pi^2 m/s^2$ (D)$8\pi^2 m/s^2$

56. In uniform circular motion, the velocity vector and acceleration vector are

(A) Perpendicular to each other (C) Same direction

(B) Opposite direction (D) Not related to each other

57. A 500 kg car takes a round turn of radius 50 m with a velocity of 36 km/hr. The centripetal force is

(A) 250 N (B) 750 N (C) 1000 N (D) 1200 N

58. The range of a particle when launched at an angle of 15^0 with the horizontal is 1.5 km. What is the range of the projectile when launched at an angle of 45^0 to the horizontal

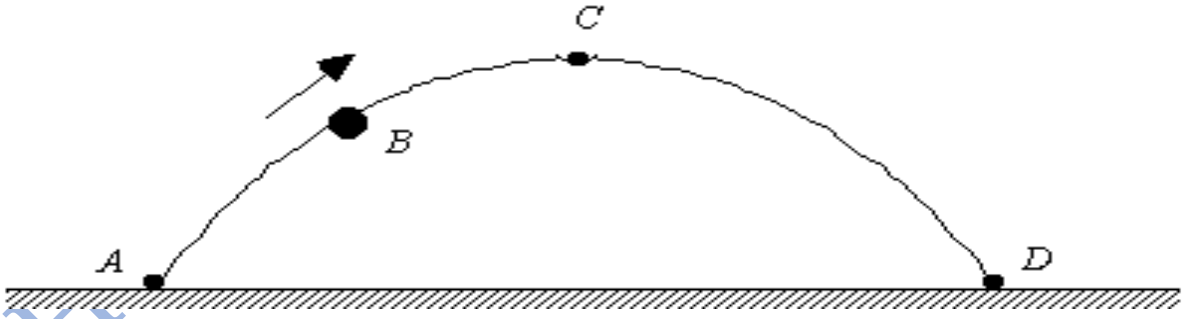
(A) 1.5 km (B) 3.0 km (C) 6.0 km (D) 0.75 km

59. A particle moves along a straight line such that its displacement at any time t is given by $\vec{S}(t) = (t^3 - 6t^2 + 3t + 4)$ m. The ***velocity*** when the acceleration is zero is

(A) 3 m/s (B) – 12 m/s (C) 42 m/s (D) – 9 m/s

Answer questions 60 – 61 based on the information given below

A tennis ball is thrown upward at an angle from point A. It follows a parabolic trajectory and hits the ground at point D. At the instant shown, the ball is at point B. Point C represents the highest position of the ball above the ground.



60. How do the x and y components of the velocity vector of the ball compare at the ***points B and C***?

A) The velocity components are non-zero at B and zero at C.

B) The x components are the same; the y component at C is 0 m/s.

C) The x components are the same; the y component has a larger magnitude at C than at B.

D) The x component is larger at C than at B; the y component at B points up while at C, it points downward.

E) The x component is larger at B than at C; the y component at B points down while at C, it points upward**.**

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61. Which statement is true concerning the ball when it is at C, ***the highest point*** in its trajectory?
A) The ball's velocity and acceleration are both zero.
B) The ball's velocity is perpendicular to its acceleration.
C) The ball's velocity is not zero, but its acceleration is zero.
D) The ball's velocity is zero, but its acceleration is not zero
E) The horizontal and vertical components of the ball's velocity are equal**.**

62. Uniform circular motion is a
A. Motion with constant velocity B. motion in which net force is constant
C. motion in one dimension D.. motion with acceleration of constant magnitude.

63. A small car and a bus move with velocities given by $\vec{V}_c$ = (3i-2j)m/s and $\vec{V}_b$ = (-5i – 4j)m/s respectively according to the observer on the ground . What is the velocity of the bus according to a car driver ?
A. (-2i +6j)m/s B. (-2i-6j)m/s C. (-8i + 2j)m/s D(-8i-2j)m/s

64. An object of mass m moving with an initial speed of 15m/s got an acceleration of 10 m/s^2 after a constant force F applied to it. How long does it take for an object to reach 90 meteres from its initial position?
A. 3.22s B. 0.75sec C) 3s D. 2.5sec

65. A truck traveled 400 meters North in 80 seconds, and then it traveled 300 meters East in 70 seconds. The magnitude of the average velocity of the truck was most nearly
(A) 1.2 m/s (B) 3.3 m/s (C) 4.6 m/s (D) 6.6 m/s

66. Consider the following velocities and accelerations of a particle. In which case, the ***particle is slowing down***?
A. II , III and IV
B. III and IV
C. I and IV
D. II and III

Cases	*Velocity (m/s)*	*Acceleration (m/s^2)*
I	*+4*	*+2*
II	*+4*	*-2*
III	*-4*	*+2*
IV	*-4*	*-2*

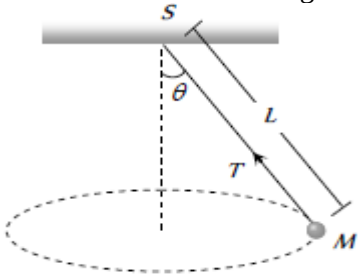
67. The motion of a projectile is described by the equation $y = ax - bx^2$**.** The range of projectile is.
A. $\frac{b}{a}$ B. $\frac{a}{2b}$ C. $\frac{2a}{b}$ D. $\frac{a}{b}$

68. Which one of the following is ***false*** about ***projectile motion***?
A. The vertical motion of the projectile is an example of uniformly accelerated motion.
B. At the top of the trajectory, the projectile has zero vertical velocity but its acceleration is –g.
C. Horizontally, the projectile is in constant velocity and its acceleration is zero.
D. If we ignore the air resistance, then there are horizontal forces acting on the projectile as it flies through the air.

69. At what point of a projectile motion acceleration and velocity are perpendicular to each other
(A) At the point of projection (B) At the point of drop
(C) At the topmost point (D) Anywhere in between the point of projection and topmost point

70. . A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10 m/sec. A plumb bob is suspended from the roof of the car by a light rigid rod of length 1.00 m. The angle made by the rod with track is
(a) Zero (b) 30^0 (c) 60^0 (d) 45^0

71. A string of length L is fixed at one end and carries a mass M at the other end. The string makes $2/\pi$ revolutions per second around the vertical axis through the fixed end as shown in the figure, then tension in the string is
(A) ML
(B) 2 ML
(C) 4 ML
(D) 16 ML



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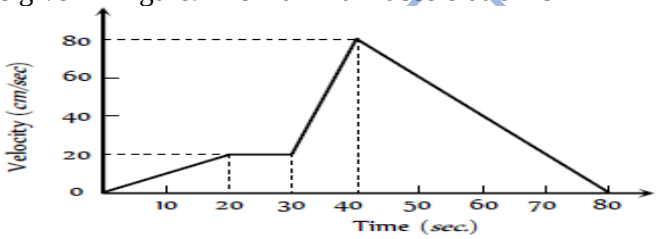
72. If two bodies are projected at 30^0 and 60^0 respectively, with the same velocity, then
(A) Their ranges are same (B) Their heights are same
(C) Their times of flight are same (D) All of these

73. A bullet is fired from a cannon with velocity 500 m/s. If the angle of projection is 15^0 and g = 10 m/s^2. Then the range is
(a) 25×10^3m (b) 12.5×10^3m (c) 50×10^2m (d)25×10^2m

74. The horizontal range is four times the maximum height attained by a projectile. The angle of projection is
(a) 90^0 (b) 30^0 (c) 60^0 (d) 45^0

75. A particle (A) is dropped from a height and another particle (B) is thrown in horizontal direction with speed of 5 m/sec from the same height. The correct statement is
(A) Both particles will reach at ground simultaneously
(B) Both particles will reach at ground with same speed
(C) Particle (A) will reach at ground first with respect to particle (B)
(D) Particle (B) will reach at ground first with respect to particle (A)

76. The v – t graph of a moving object is given in figure. The maximum acceleration is
(A) 1 cm/sec^2
(B) 2 cm/sec^2
(C) 3 cm/sec^2
(D) 2 cm/sec^2



77. The maximum range of a gun on horizontal terrain is 16 km. If g = 10 m/s^2. What must be the muzzle velocity of the shell
(a) 200 m/s (b) 400 m/s (c) 100 m/s (d) 50 m/s

78. A particle is moving in a circle of radius R with constant speed v, if radius is double then its centripetal force to keep the same speed should be
(a) Doubled (b) Halved (c) Quadrupled (d) Unchanged

79. . If the length of the second's hand in a stop clock is 3 cm the angular velocity and linear velocity of the tip is
(A) 0.2047 rad/sec., 0.0314 m/sec (b) 0.2547 rad/sec., 0.314 m/sec
(c) 0.1472 rad/sec., 0.06314 m/sec d) 0.1047 rad/sec., 0.00314 m/sec

80. . A particle of mass M moves with constant speed along a circular path of radius r under the action of a force F. Its speed is
A. $\sqrt{\frac{Fr}{m}}$ B. $\sqrt{\frac{F}{mr}}$ C. $\sqrt{\frac{F}{r}}$ D. $\sqrt{Fmr}$

81. In an atom for the electron to revolve around the nucleus, the necessary centripetal force is obtained from the following force exerted by the nucleus on the electron
(a) Nuclear force (b) Gravitational force (c) Magnetic force (d) Electrostatic force

82. A thief is running away on a straight road in jeep moving with a speed of 9 m/s. A police man chases him on a motor cycle moving at a speed of 10m/s. If the instantaneous separation of the jeep from the motorcycle is 100 m, how long will it take for the police to catch the thief
(a) 1 s (b) 19 s (c) 90 s (d) 100 s

83. . Two trains one of length 100 m and another of length 125 m, are moving in mutually opposite directions along parallel lines, meet each other, each with speed 10 m /s . If their acceleration are 0.3m/s^2 and 0.2 m/s^2respectively, then the time they take to pass each other will be
(a) 5 s (b) 10 s (c) 15 s (d) 20 s

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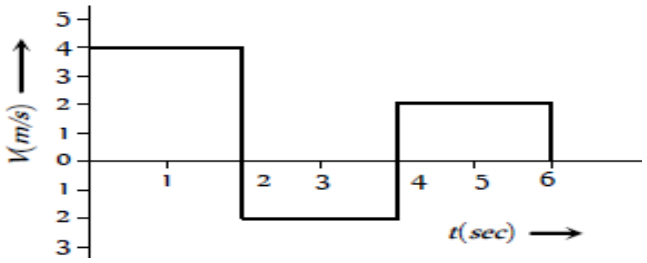
84. The velocity-time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 sec are respectively

(A) 8 m, 16 m

(B) 16 m, 8 m

(C) 16 m, 16 m

(D) 8 m, 8 m



85. A body is thrown horizontally from the top of a tower of height 5 m. It touches the ground at a distance of 10 m from the foot of the tower. The initial velocity of the body is (g = 10 m/s^2)

(a) 2.5 m/s (b) 5 m/s (c) 10 m/s (d) 20 m/s

86. An airplane moving horizontally with a speed of 720 km/h drops a food pocket, while flying at a height of 396.9 m. the time taken by a food pocket to reach the ground and its horizontal range is (Take g = 9.8 m/s^2

(a) 3 sec and 2000 m (b) 5 sec and 500 m (c) 8 sec and 1500 m (d) 9 sec and 1800 m

87. An object of mass 3kg is moving in a vertical circle attached to a piece of rope which is anchored in the center of the circle. The circle has a radius of 1 m and the object is moving at a steady speed of 5 m/s. What is the tension in the rope at the bottom, top and halfway of the circle respectively?

A. 105N , 75N ,45N B. 75N ,45N,105N C. 45N ,75N,105N D. 105N ,45N,75N

88. When a body is thrown with a velocity u making an angle θ with the horizontal plane, the maximum distance covered by it in horizontal direction is

A. $\frac{u^2 sin\theta}{g}$ B. $\frac{u^2 sin2\theta}{g}$ C. $\frac{u^2 sin\theta}{2g}$ D. $\frac{u^2 cos2\theta}{2g}$

89. A ball is thrown upwards and it returns to ground describing a parabolic path. Which of the following remains constant

(a) Kinetic energy of the ball (C) Speed of the ball

(b) Horizontal component of velocity (d) Vertical component of velocity

90. At the top of the trajectory of a projectile, the directions of its velocity and acceleration are

(a) Perpendicular to each other (c) Parallel to each other

(b) Inclined to each other at an angle of 45^0 (d) Antiparallel to each other

91. The angle of projection at which the horizontal range and maximum height of projectile are equal is

A. 45^0 B. 60^0 C. $\theta = \tan^{-1}(0.25)$ D. $\theta = \tan^{-1}(4)$ *or* $\theta = 76^0$

92. A projectile fired with initial velocity u at some angle θ has a range R . If the initial velocity be doubled at the same angle of projection, then the range will be

(a) 2R (b) $\frac{R}{2}$ (c) R (d) 4R

93. If the initial velocity of a projectile be doubled, keeping the angle of projection same, the maximum height reached by it will

(a) Remain the same (b) Be doubled (c) Be quadrupled (d) Be halved

94. A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following

(a) Straight path (b) Circular path (c) Parabolic path (d) Hyperbolic path

95. The coordinates of a moving particle at any time 't' are given by x = αt^3 and y = βt^3 .The speed of the particle at time 't' is given by

A. $3t\sqrt{\alpha^2 + \beta^2}$ B. $3t^2\sqrt{\alpha^2 + \beta^2}$ C. $t^2\sqrt{\alpha^2 + \beta^2}$ D. $\sqrt{\alpha^2 + \beta^2}$

96. A cyclist riding the bicycle at a speed of 14 $\sqrt{3}$ takes a turn around a circular road of radius 20 $\sqrt{3}$ m without skidding. Given g = 9.8 m/s. what is his inclination to the vertical

A. 30^0 B. 90^0 C. 45^0 D. 60^0

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97. A stone tied with a string, is rotated in a vertical circle. The minimum speed with which the string has to be rotated

(a) Is independent of the mass of the stone (c) Is independent of the length of the string

(b) Decreases with increasing mass of the stone (d) Decreases with increasing in length of the string

98. . An aeroplane is flying horizontally with a velocity of 600 km/h at a height of 1960 m. When it is vertically at a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is

(a) 1200 m (b) 0.33 km (c) 3.33 km (d) 33 km

99. A ball is rolled off the edge of a horizontal table at a speed of 4 m/second. It hits the ground after 0.4 second. Which statement given below is true

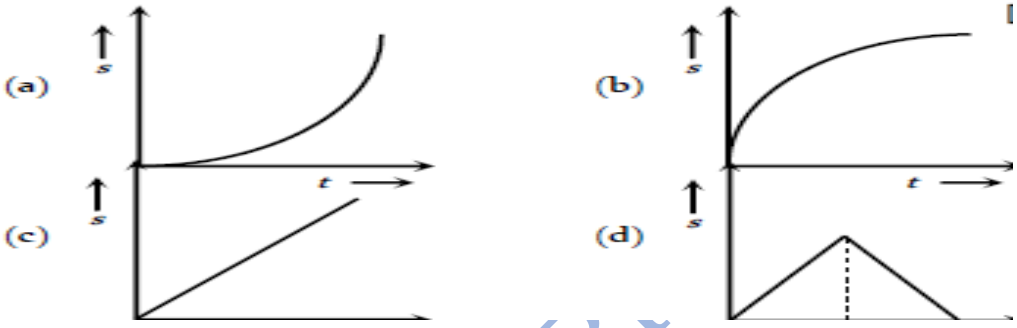
(a) It hits the ground at a horizontal distance 1.6 m from the edge of the table

(b) The speed with which it hits the ground is 4.0 m/second

(c) Height of the table is 0.8 m

(d) It hits the ground at an angle of 60^0 to the horizontal

100. Which graph represents the uniform acceleration?



101. A train has a speed of 60 km/h. for the first one hour and 40 km/h for the next half hour. Its average speed in km/h is

(a) 50 (b) 53.33 (c) 48 (d) 70

102. A ball is projected upwards from a height h above the surface of the earth with velocity v . The time at which the ball strikes the ground is

(A) $\frac{v}{g} + \frac{2hg}{\sqrt{2}}$ (B) $\frac{v}{g}\left[1 - \sqrt{1 + \frac{2h}{g}}\right]$

(C) $\frac{v}{g}\left[1 + \sqrt{1 + \frac{2gh}{V^2}}\right]$ (D) $\frac{v}{g}\left[1 + \sqrt{V^2 + \frac{2h}{g}}\right]$

103. A balloon starts rising from the ground with an acceleration of 1.25 m/s 2 after 8s, a stone is released from the balloon. The stone will (g = 10 m/s 2)

(a) Reach the ground in 4 second (b) Begin to move down after being released

(c) Have a displacement of 50 m (d) Cover a distance of 40 m in reaching the ground

104. One car moving on a straight road covers one third of the distance with 20 km/hr and the rest with 60 km/hr. The average speed is

(a) 40 km/hr (b) 80 km/hr (c) 3 2 46 km/hr (d) 36 km/hr

105. A particle is projected up with an initial velocity of 80 ft /sec . The ball will be at a height of 96 ft from the ground after

(a) 2.0 and 3.0 sec (b) Only at 3.0 sec (c) Only at 2.0 sec (d) After 1 and 2 se

106. A boat is moving with velocity of $3\hat{\imath} + 4\hat{\jmath}$ in river and water is moving with a velocity of i $-3\hat{\imath}$ - $4\hat{\jmath}$ with respect to ground. Relative velocity of boat with respect to water is :

(a) $-6\hat{\imath} - 8\hat{\jmath}$ (b) $6\hat{\imath} + 8\hat{\jmath}$ (c) $8\hat{\imath}$ (d) $6\hat{\imath}$

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107. The distance between two particles is decreasing at the rate of 6 m/sec. If these particles travel with same speeds and in the same direction, then the separation increase at the rate of 4 m/sec. The particles have speeds as
(a) 5 m/s ; 1 m/s (b) 4 m/s ; 1 m/s (c) 4 m/s ; 2 m/s (d) 5 m/s ; 2 m/s

108. Two trains, each 50 m long are travelling in opposite direction with velocity 10 m/s and 15 m/s. The time of crossing is
(a) 2s (b) 4 s (c) 2 3s (d) 4 3 s

109. A bullet is fired with a speed of 1000 m /sec in order to hit a target 100 m away. If g = 10 m / s , the gun should be aimed
a) Directly towards the target (b) 5 cm above the target
(c) 10 cm above the target (d) 15 cm above the target

110. A car travels the first half of a distance between two places at a speed of 30 km/hr and the second half of the distance at 50 km/hr. The average speed of the car for the whole journey is
(a) 42.5 km/hr (b) 40.0 km/hr (c) 37.5 km/hr (d) 35.0 km/hr

111. Two trains, each 50 m long are travelling in opposite direction with velocity 10 m/s and 15 m/s. The time of crossing is
(a) 2s (b) 4 s (c) $2\sqrt{3}$s (d) $4\sqrt{3}$ s

112. A man is 45 m behind the bus when the bus start accelerating from rest with acceleration 2.5 m/s 2 . With what minimum velocity should the man start running to catch the bus ?
(a) 12 m/s (b) 14 m/s (c) 15 m/s (d) 16 m/s

113. A police jeep is chasing with, velocity of 45 km/h a thief in another jeep moving with velocity 153 km/h. Police fires a bullet with muzzle velocity of 180 m/s. The velocity it will strike the car of the thief is
(a) 150 m/s (b) 27 m/s (c) 450 m/s (d) 250 m/s

114. A boat is sent across a river with a velocity of 8 km/hr. If the resultant velocity of boat is 10 km/hr, then velocity of the river is :
(a) 10 km/hr (b) 8 km/hr (c) 6 km/hr (d) 4 km/hr

115. A stone falls from a balloon that is descending at a uniform rate of 12 m / s . The displacement of the stone from the point of release after 10 sec is
(a) 490 m (b) 510 m (c) 610 m (d) 725 m

116. . A ball P is dropped vertically and another ball Q is thrown horizontally with the same velocities from the same height and at the same time. If air resistance is neglected, then
(a) Ball P reaches the ground first
(b) Ball Q reaches the ground first
(c) Both reach the ground at the same time
(d) The respective masses of the two balls will decide the time

117. In case of uniform circular motion which of the following physical quantity do not remain constant
(a) Speed (b) Momentum (c) Kinetic energy (d) Mass

118. A stone ties to the end of a string 1m long is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolutions in 44 seconds, what is the magnitude and direction of acceleration of the stone
(a) $\frac{\pi^2}{4}$m/ $s^2$and direction along the radius towards the center
(b) π^2 m/ s^2 and direction along the radius away from the centre
(c) π^2 m/ $s^2$and direction along the radius towards the centre
(d) π^2 m/ $s^2$and direction along the tangent to the circle

119. A 2 kg stone at the end of a string 1 m long is whirled in a vertical circle at a constant speed. The speed of the stone is 4 m/sec. The tension in the string will be 52 N, when the stone is
(a) At the top of the circle (b) At the bottom of the circle

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(c) Halfway down (d) None of the above

120. The maximum velocity at the lowest point, so that the string just slack at the highest point in a vertical circle of radius l

(a) $\sqrt{gl}$ (b) $\sqrt{3gl}$ (c) $\sqrt{5gl}$ (d) $\sqrt{7gl}$

121. If time of flight of a projectile is 10 seconds. Range is 500 meters. The maximum height attained by it will be

(a) 125 m (b) 50 m (c) 100 m (d) 150 m

122. A weightless thread can bear tension upto 3.7 kg wt. A stone of mass 500 gms is tied to it and revolved in a circular path of radius 4 m in a vertical plane. If , then the maximum angular velocity of the stone will be

(a) 4 radians/sec (b) 16 radians/sec (c) 21 radians/sec (d) 2 radians/se

123. An areophane flying 490 m above ground level at 100 m/s, releases a block. How far on ground will it strike

(a) 0.1 km (b) 1 km (c) 2 km (d) None of these

124. A body is thrown horizontally from the top of a tower of height 5 m. It touches the ground at a distance of 10 m from the foot of the tower. The initial velocity of the body is

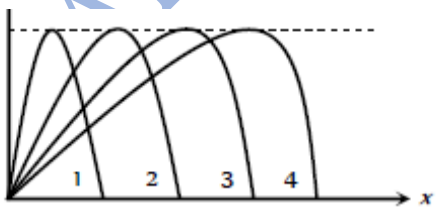
(a) 2.5 m/s (b) 5 m/s (c) 10 m/s (d) 20 m/s

125. A ball of mass 0.1 kg is suspended by a string. It is displaced through an angle of $60^0$and left. When the ball passes through the mean position, the tension in the string is

(a) 19.6 N (b) 1.96 N (c) 9.8 N (d) Zero

126. Figure shows four paths for a kicked football. Ignoring the effects of air on the flight, rank the paths according to initial horizontal velocity component, highest first

(a) 1, 2, 3, 4
(c) 2, 3, 4, 1
(b) 3, 4, 1, 2
(d) 4, 3, 2, 1



UNIT 4 DYNAMICS

Part One (2002E.C) total UEE questions =4

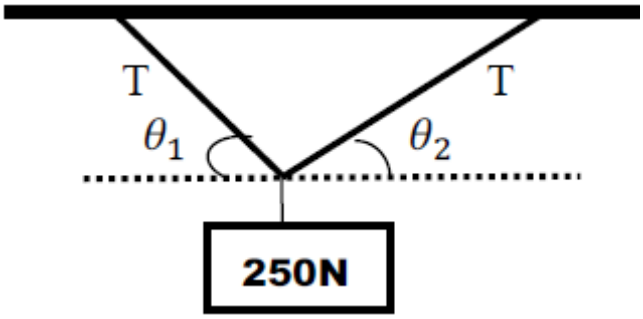
_____**1.** Traffic light weighting 250N are suspended from a cable as shown . What is the tension T in the string if the two marked angles are equal to 30 degrees.

A.120N

B.165N

C.196N

D.250N



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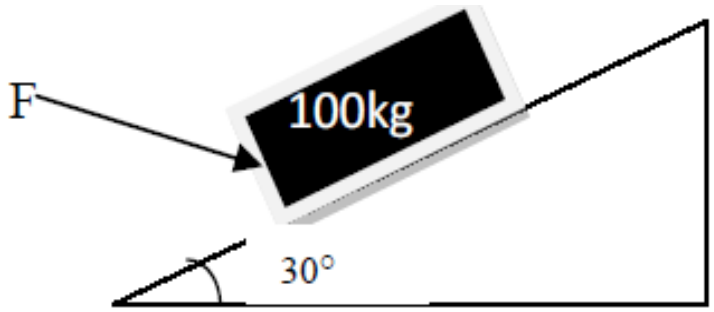
_____**2.** A 100kg box is pushed at a constant speed up the smooth 30° inclined plane shown below. What is the horizontal force required?

A.577.35N

B.1000.35N

C.1732.35N

D.1154.70N



_____**3.** The net force acting on a particle is zero .Which one of the following quantities may vary with time?

A. The momentum of the system

B. the kinetic energy of the system

C. the velocity center of mass the system

D. the position of the center of mass of the system

_____**4.** A car moving at a speed V collides with an identical stationary cart on an air track and the two sticks together after collision .What is their common velocity after collision?

A.-0.5V B.0.5V C.V D. Zero

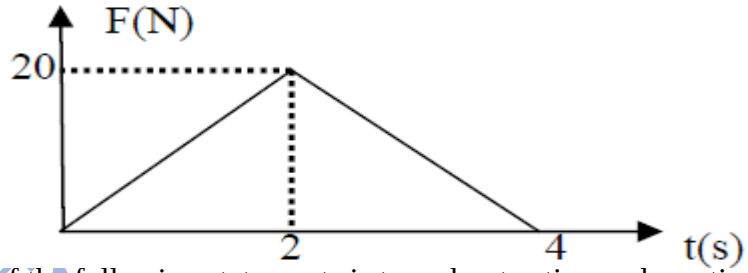
_____**5.** A force F acts on a ball initially at rest on a smooth surface for a time t .The variation of F with t is shown in the figure below .The momentum of the ball in Ns , after 4sec is

A.10

B.20

C.30

D.40



_____**6.** Which one of the following statements is true about action and reaction forces referred to in Newton's third law of motion?

A. They act on the same body

B. they act upon two different bodies

C. They are equal in magnitude but need not have the same line of action

D. They are not equal in magnitude but have the same line of action

_____**7.** A 4 kg block is given an initial speed of 8m/s at the bottom of 30° inclined plane .The frictional force retards its motion is 15N .If the block is directed up the inclined plane , how far will it move before it stops?

A.3.35m B.3.66m C.4.40m D.4.67m

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_____**8.** Which pair of forces cannot produce a resultant of 5N?

A.1N, 4N B.1N ,6N C.3N ,4N D.1N ,7N

_____**9.** A block slides on a rough 45° incline .The coefficient of friction and inclined is μk .What is the ratio of acceleration when the block accelerates down the incline to the acceleration when the block is projected up the plane

A. $\frac{\mu_k-1}{\mu_k+1}$ B. $\frac{1-\mu_k}{1+\mu_k}$ C. . $\frac{\mu_k}{\mu_k+1}$ D. . $\frac{\mu_k+1}{\mu_k-1}$

_____**10.** when a small mass m is suspended from one end of a vertical string and whirled in a horizontal circle at constant speed V

A. The string stays vertical

B. The string becomes inclined to the vertical

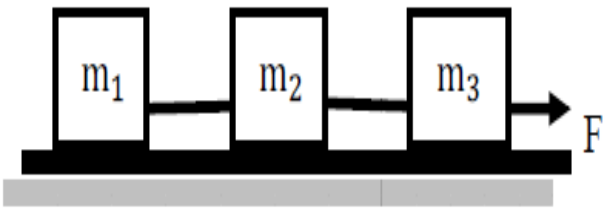
C. there is no force on m except its weight

D. The angle of inclination to the vertical of the string does not depend on V

_____**11.** Three blocks of mass m_1, m_2.,and m_3 are connected by thread and placed on a smooth horizontal surface as shown in the figure below .A force F is applied on the block mass m3 in the forward direction as shown .Neglecting friction .find the tension in the thread connecting m1 and m2.

A. $\frac{m_1F}{m_1+m_2+m_3}$ B. $\frac{m_2F}{m_1+m_2+m_3}$

C. $\frac{m_3F}{m_1+m_2+m_3}$ D . $\frac{(m_2+m_3)F}{m_1+m_2+m_3}$



Part Three (2004E.C) total UEE questions = 3

_____**12.** A car (mass m1) is deriving at velocity V ,when it smashes into an unmoving car (mass m2) ,locking bumpers .Both cars move together at the same velocity .The common velocity will be given by

A. $\frac{m_2V}{m_2}$ B. $\frac{m_2V}{m_1}$ C. $\frac{m_1V}{m_1+m_2}$ D. $\left(\frac{m_2+m_1}{m_1}\right)V$

_____**13.** A wheel starts from rest and rotates with constant angular acceleration to reach an angular speed of 12 rad/s^2 in 3s .What is the magnitude of the angular acceleration of the wheel in rad/s^2 and angle in radians through which it rotates in this time respectively?

A.4,18 B.3,18 C.18,5 D.18,5

Part four (2005E.C) total UEE questions = 4

_____**14.** A 2kg object experiences two concurrent force of 100N at 30^0 above the positive x – axis and 80N at 60^0 above the negative x – axis what is the magnitude of acceleration of the object?

A. 68m/s^2 B) 48m/s^2 C) 46m/s^2 D) 64m/s^2

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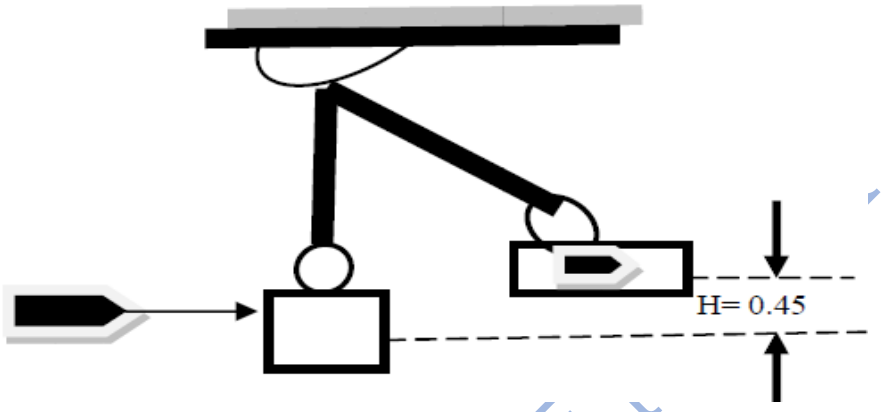
_____**15.** A bullet 0f mass 10gm moving horizontally , strikes and embedded itself in a box of mass 1kg suspended from a light string as shown in the figure below. If the composite mass rises to a height h = 0.45m , then what is the speed of the bullet before collision?

A.303m/s

B.300m/s

C.90.9m/s

D.90m/s



Part five (2006E.C) total UEE questions = 2

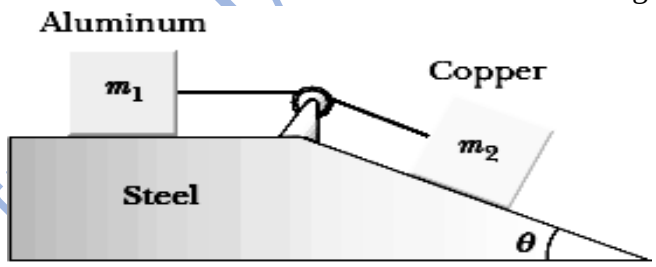
_____**16.** .An aluminum block of mass m1 = 3kg and a copper block of mass m2 = 5kg are connected by a light string over a friction less pulley .They sit on on steel surface as shown in figure below where Θ = 53°.The coefficient of kinetic friction b/n the steel surface and each block is 0.3 . If the blocks are released from rest What is the tension T in the string?

A.29.40 N

B.17.25N

C. 12.205N

D.8.60N



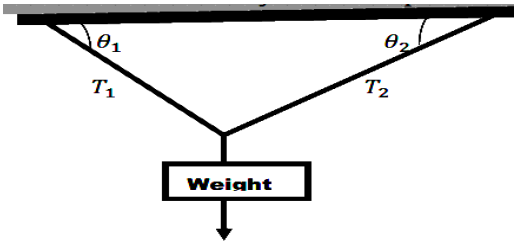
_____**17.** An object of mass 3kg hangs from the light inextensible wires as shown in figure below Two wires make angles Θ1 = 53° and Θ2 = 37° with the horizontal .If the system is in equilibrium , what will be the tensionsT_1 and T_2 in the wires?

A. T_1 = 18N and T_2= 24N

B. T_1 = T_2= 24N

C. T_1 = T_2= 18N

D. T_1 = 24N andT_2= 18N



_____**18.** Two particles with masses 2m and 3m are moving toward each other along the x axis with same initial speed v . particle 2m is travelling to the left and particle 3m is travelling to the right .They undergo an elastic glancing collision such that particle 2m is traveling along in he negative y – direction after the collision . What are the x – component of the final velocity of particle 3m and the kinetic energy of the particle 12m respectively.

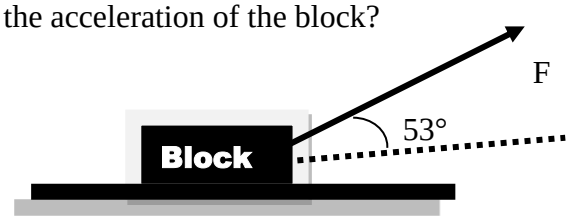
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A. 0.33V and 0.7mv^2 B. 0.33V and 1.40mv^2

C. 0.670V and 0.7mv^2 D. 0.67V and 1.4 mv^2

Part six (2007E.C) total UEE questions = 5

_____**19.** A force of magnitude 20N is applied to a mass of 2kg that lies on a rough horizontal surface as shown I figure below .The coefficient kinetic friction b/n the block and surface is 0.4.What is the magnitude of the acceleration of the block?



A. 10m/s^2

B. 5.2m/s^2

C.4m/s^2

D.2.8m/s^2

_____**20.** . A hard ball moving on a horizontal frictionless surface with a speed of 5m/s in the positive x direction strikes a stationary hard ball of the same mass .After collision the first ball ,moves a a speed of 4m/s along a direction that makes an angle of 37° with its initial direction of motion .What is the strike ball's speed and the smallest angle b/n its direction of motion and the positive x axis after the collision ?

A.3m/s and 53° B.3m/s and 37° C. 4m/s and 53° D. 4m/s and 37°

_____**21.** A ,man standing on frictionless on a surface continuously fired 120bullets horizontally in 1 minute using a machine gun. If each bullet has a mass of 10g and leaves the muzzle of the gun with a speed of 800m/s .What is the average force exerted by the gun on the man?

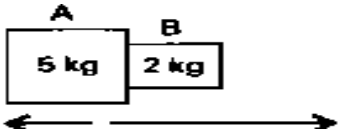
A.8N B.16N C.960N D.1600N

_____**22.** A highway curve is banked (inclined) in such a way that a car travelling a speed of 13.5/s can round the curve without skidding in the absence of friction. If the banking angle is 30° what is the radius of the curve?

A.10.5m B.21.0m C.31.7m D.36.7m

Part seven (2008E.C) total UEE questions = 2

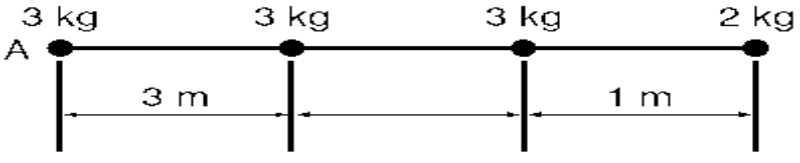
_____**23.** Consider a large mass (A) and a small mass(B) which are one another apart, as shown in Figure. The small mass moves away at a velocity of 20 m/s to the right. What is the recoil velocity of the large mass?



A. -20m/s B. 8m/s

B. 20m/s D. -8m/s

_____**24.** Find the distance of the centre of mass of the system shown in the diagram from point A. The rod is massless.



A)3.73 B)2.09

C)2.45 D)5.86

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Part eight (2009E.C) total UEE questions = 3

_____**25.** An 1 kg object explodes and breaks up into three pieces. One piece has a mass of 400 g and has a velocity of (5i+10j)m/s. A second piece has a mass of 250 g and has a velocity of (25i - 10j)m/s. What is the velocity of the third piece?

A. $(-4.3\vec{i} + 35\vec{j})$m/s B.$(-35\vec{i} - 4.3\vec{j})$m/s C. $(35\vec{i} - 4.3\vec{j})$m/s D. $(-35\hat{i} - 4.3\hat{j})$m/s

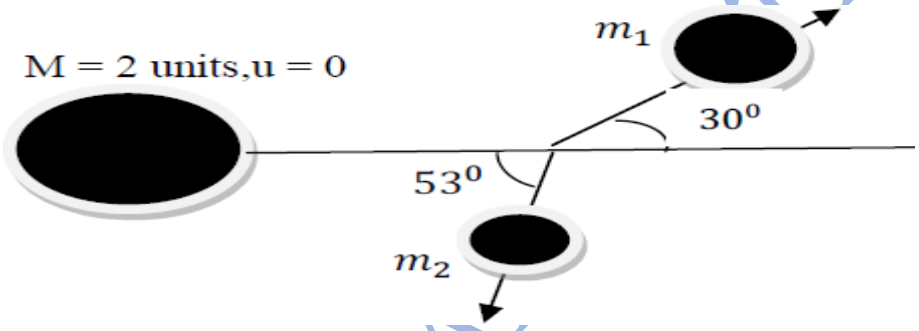
_____**26.** A uranium atom initially at rest has a mass of 2 units and spontaneously disintegrated into two fragments .One of the fragment has a mass of 0.8 units and moves at a speed of 24 m/s as shown in the figure below. What is the speed of the second fragment?

A.25.6m/s

B. 21.3m/s

C.16m/s

D.14.8m/s



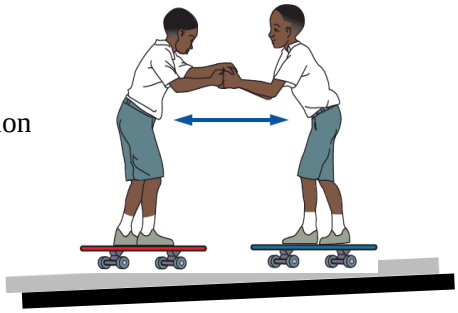
Part nine (2010E.C) total UEE questions = 2

_____**27.** For a constant force F, if the impulse imparted to the system is large, then what can you said about the collision?

A. The contact or impact time is large C. Linear momentum is conserved

B. Kinetic energy is conserved D. The change in velocity is small

_____**28.** Two students A and B with masses m_A and m_B respectively , stand on a wheeled trolleys as shown in the figure below. If student A has larger mass and pushes student B , then what can be said about their accelerations?



A. The acceleration of student B is less than that of student A.

B. Both boys will be accelerated by the same magnitude but in opposite direction

C. There would be no acceleration because the forces are equal and opposite

D. The acceleration of student A is less than that of student

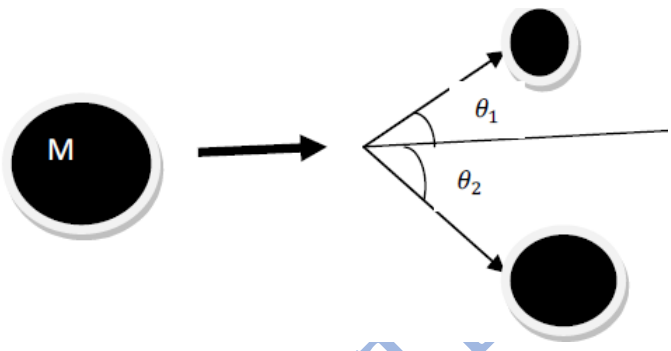
Part ten (2011E.C) total UEE questions = 4

_____**29.** A 5kg mass pushed upward along an inclined plane of inclination 30^0 with constant force, F. If the acceleration the block for this motion is 1.0m/s^2 and the plane is assumed to be frictionless, what is the magnitude of the constant force F?

A.5.0N B. 25.0N C. 20.0N D. 30.0N

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_____**30.** A ball off mass M moves with speed V in the + x direction. It explodes into two pieces that go off at an angles θ_1 and θ_2 ,as shown below. What are the magnitude of the momenta of the two pieces?



A. $P_1 = \frac{MV\cos\theta_2}{\sin(\theta_1+\theta_2)}$ and $P_2 = \frac{MV\cos\theta_1}{\sin(\theta_1+\theta_2)}$

B. $P_1 = \frac{MV\sin\theta_2}{\sin(\theta_1+\theta_2)}$ and $P_2 = \frac{MV\sin\theta_1}{\sin(\theta_1+\theta_2)}$

C. $P_1 = MV\tan\theta_2$ and $P_2 = MV\tan\theta_1$

D. $P_1 = \frac{MV\cos\theta_2}{\cos(\theta_1+\theta_2)}$ and $P_2 = \frac{MV\cos\theta_1}{\cos(\theta_1+\theta_2)}$

_____**31.** The rate of change of ,momentum of the raindrop can be given by $\boldsymbol{F = ma + u\frac{\Delta m}{\Delta t}}$. In this expression what does u reperesnt?

A. The velocity of the extra mass added to the raindrop
B. The velocity of the rain drop
C. The velocity of the loss in mass of raindrop
D. The rat of change of the velocity for combined system

_____**32.** A trolley is set to move on a smooth track that is banked at an angle of 30^0. For a trolley with a speed 55m/s to round the curve, what is the radius of the banked surface?

A. 5.0m B. 2.5m C. 10m D. 3.5m

Part Eleven (2012E.C) total UEE questions = 4

_____**33.** According Newton's law of universal Gravitation

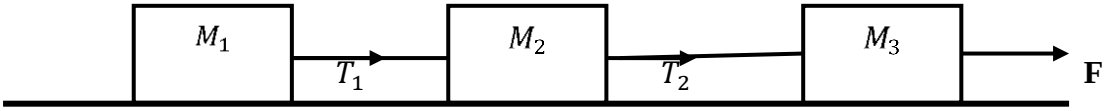
A. For two interacting objects, the gravitation force exerted on a light objects is less than the force on the heavy one.
B. The speed of a satellite moving around the Earth is in a circular orbit depends on the mass of the satellite.
C. The gravitational attraction b/n two objects is directly proportional to the square of the distance b/n them
D. The period of a satellite orbiting the earth in a circular r orbit increases as the radius of the its orbit increase

_____**34.** Which of the following is true about fundamental forces?

A. Electromagnetic force is a long –range attractive force b/n particle due to their masses
B. A weak nuclear force is an extremely short range force that binds protons and neutrons together in a nucleus.
C. Strong nuclear force is a short range force that holds protons and neutrons to form atomic nucleus
D. Gravitational force is a long –range attractive force b/n particle due to their charges.

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_____**35.** Three blocks of masses M_1 = 1kg , M_2 = 2kg , and M_3 = 3kg ,placed on a horizontal frictionless table ,are connected with strings and pulled to the right by a force F = 9N as shown below .The acceleration a, tensions T_1 and T_2 ,are respectively.



A. a = 3/2 m/s^2, T_1 = 3/2 N , T_2= 9/2 N C. a = 3 m/s^2, T_1 = 3 N , T_2= 9/2 N

B. . a = 2/3 m/s^2, T_1 = 2/3N , T_2= 2N D. a = 3/2 m/s^2, T_1 = 3 N , T_2= 9/2 N

_____**36.** Two masses m_1 and m_2 are balanced on a horizontal stick of negligible mass pivoted at the center of mass he system. .If the distance from m_1 to the center of mass is 3.0m and the distance from the mass m_2 to the center of mass is 1.0m , the ration of m_1 to m_2 (m_1 /m_2) is

A. 1/3 B. 3 C. ¾ D. 4/3

_____**37.** Which of the following is correct about an astronaut inside an international space station orbiting the earth?

A. Because the earth exerts a large force on the astronaut than on the space station ,, the astronaut experienced weightlessness

B. The astronaut experienced weightlessness Because the space station and the astronaut are freely falling towards the center of the earth.

C. The astronaut experienced weightlessness since the earth's gravitational force on the astronaut is less than the Earth's force on the space station

D. Since the earth exerts equal forces on both the astronaut and the space, astronaut experienced weightlessness.

Part 12 (2013/2014E.C) total UEE questions =

_____**38.** Dynamics is a branch of mechanics concerned with the motion of an object

A. under the action of forces C. without its causes

B. under the action of balanced forces D. whose velocity is constant

_____**39.** Which one of the following statements is true correct about the impulse on an object?

A. The impulse on an object is changed when the net force acting on the object is zero

B. The area under the curve of momentum versus time graph is the impulse on an object.

C. impulse is the change in momentum when a force is exerted on an object for a very short period of time.

D. impulse is the rate of change in momentum due to external force exerted on an object for a very short period of time.

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_____**40.** Consider two collisions, that occurred between two trollies having the same mass; moving the same speed, and in opposite direction,

Collision 1:- after collision the trollies bounce back with the same speed.

Collision 2:- after collision the trollies stick together due to magnetic coupler

Which of the following statement is correct about the two collisions?

A. Both collisions are elastic
B. Both collisions are inelastic
C. Collision 1 is elastic and Collision 2 is inelastic
D. Collision 1 is inelastic and Collision 2 is elastic

Self-Test Exercise.

1. Which one of the following statement is true about action and reaction forces referred to in Newton's third law of motion?

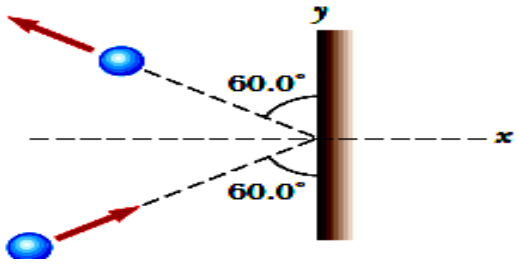
A. They act on the same body
B. They act upon two different bodies
C. They are equal in magnitude but need not have the same line of action
D. They are not equal in magnitude but have the same line of action

2. Newton's second law states that the net force acting on a body is equal to the body's time rate of change of:

A. acceleration B. mass C. momentum D. inertia

3. A 3.00-kg steel ball strikes a wall with a speed of 10.0 m/s at an angle of 60.0° with the surface. It bounces off with the same speed and angle (Fig. If the ball is in contact with the wall for 0.200 s, what is the ***magnitude of average force*** exerted by the wall on the ball?

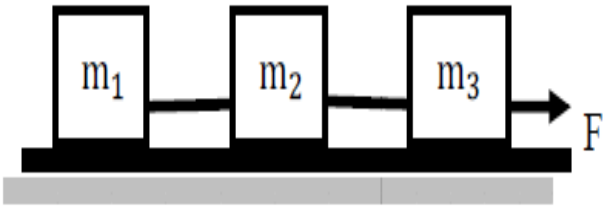
(A)150N
(B)-150N
(C)52N
(D)260N



4. A Three blocks of mass m_1, m_2.,and m_3 are connected by thread and placed on a smooth horizontal surface as shown in the figure below .A force F is applied on the block mass m3 in the forward direction as shown .Neglecting friction ,find the tension in the thread connecting m1 and m2.

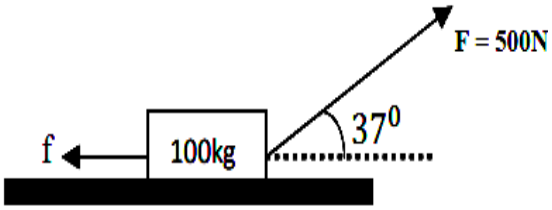
A. $\frac{m_1F}{m_1+m_2+m_3}$ B. $\frac{m_2F}{m_1+m_2+m_3}$

C. $\frac{m_3F}{m_1+m_2+m_3}$ D . $\frac{(m_2+m_3)F}{m_1+m_2+m_3}$



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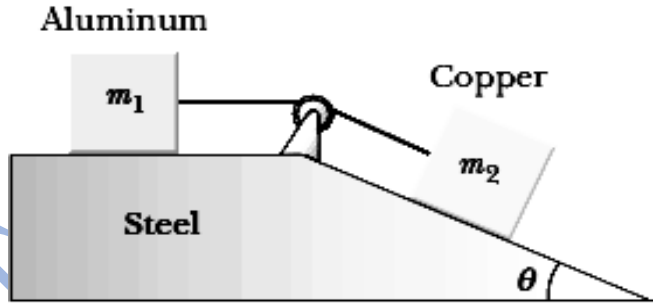
5. As shown in the figure below , a 100kg object is pulled by a force of 500N at angle of 37^0 to the horizontal . The coefficient of friction is 0.5.
(use sin 37^0 = 0.6 , cos37^0 = 0.8 , g = 10N/kg)
Which one is false statement?



A. frictional force = 350N
B. acceleration of the object = 2 m/s^2
C. normal force = 700N
D. Horizontal component of Force (F_x) = 400N

6. Which one of the following is **NOT TRUE** About impulse and momentum?
A. Impulse is the change in momentum.
B. Impulse and momentum have the same units.
C. Increasing the length of time to change the momentum reduces the size of the force needed to change the momentum.
D. Total momentum of a system of bodies stays the same even if a force acts on them to change the momentum.

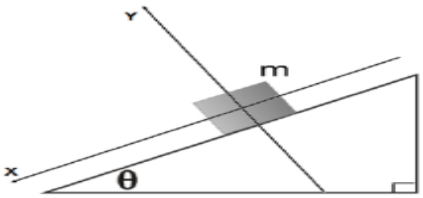
7. An aluminum block of mass m1 = 3kg and a copper block of mass m2 = 5kg are connected by a light string over a friction less pulley .They sit on steel surface as shown in figure below where Θ = 53°.The coefficient of kinetic friction b/n the steel surface and each block is 0.3 . If the blocks are released from rest What are the acceleration and tension T in the string respectively?



A. 2.75 m/s^2 , 29.40 N
B. 2.75 m/s^2, 17.25N
C. 2.75 m/s^2, 12.205N
D. 2.25 m/s^2 , 8.60N

8. For a constant force F, if the impulse imparted to the system is large, then what can you said about the collision?
C. The contact or impact time is large
C. Linear momentum is conserved
D. Kinetic energy is conserved
D. The change in velocity is small

9. In the diagram below, a block of mass m slides down an inclined plane with a constant speed at an angle θ with respect to the horizontal. Which one of the following is ***false*** statement



A. The kinetic friction force acting on the block = $\mu_k$mg cosθ
B. The horizontal component of weight (force) F_x = mg sinθ
C. The coefficient of kinetic friction , μ_k= tanθ
D. The vertical component of weight (force) F_y = Fsinθ

10. which of the following choices lists the four known types of forces in nature in order of ***decreasing strength***?
A. strong nuclear, electromagnetic, weak nuclear, gravitational
B. electromagnetic, strong nuclear, weak nuclear, gravitational
C. strong nuclear, electromagnetic, gravitational, weak nuclear
D. strong nuclear, weak nuclear, electromagnetic, gravitational

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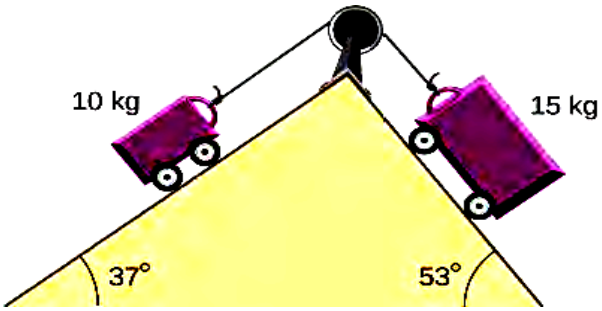
11. The change in an object's momentum is equal to
A. the product of the mass of the object and the time interval.
B. the product of the force applied to the object and the time interval.
C. the time interval divided by the net external force.
D. the net external force divided by the time interval

12. A jet engine generates 160 kN of force as it propels a 20 000 kg plane down a runway. If 40 kN of friction opposes the motion of the plane, how much time will it take for the plane to reach a speed of 33 m/s from rest?
A. 5.5ses B. 2.5sec C. 10sec D. 6sec

13. Particle A is traveling at a velocity of $\begin{bmatrix} 6 \\ -2 \end{bmatrix}$m/s It collides with particle B which has a velocity of $\begin{bmatrix} 10 \\ 8 \end{bmatrix}$m/s. The particles move together. The mass of Particle A 2kg and . The mass of Particle B is 3kg. The velocity of the combined particles after collision is
A. $\begin{bmatrix} 8 \\ 4 \end{bmatrix}$m/s B. $\begin{bmatrix} 0.84 \\ 4 \end{bmatrix}$m/s C. $\begin{bmatrix} 8.4 \\ 5 \end{bmatrix}$m/s D. $\begin{bmatrix} 8.4 \\ 4 \end{bmatrix}$m/s

14. Which of the following is ***false*** statement bout ***center of mass***?
(A) Objects are stable when the center of a mass is above a point that is inside the base of the object
(B) The center of mass is the point where the whole of the force of gravity on that body appears to be acting from.
(C) When the center of mass is directly above a point which is outside the base of an object, the object will become unstable and fall over.
(D) The center of mass can't be outside an object.

15. Shown below are two carts connected by a cord that passes over a small frictionless pulley. Each cart rolls freely with negligible friction. What are the acceleration of the carts and the tension in the cord respectively?
A) 1.2 m/s^2 and 84N
B)4.8 m/s^2 and 84N
C) 2.4 m/s^2 and 42N
D. 2.4 m/s^2 and 84N

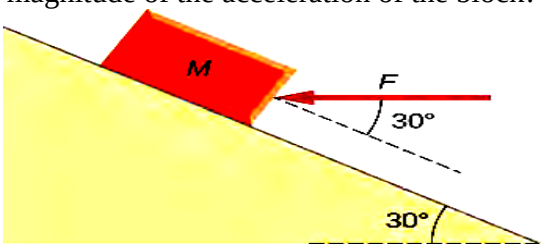


16. Which of the following are false statement bout collisions**?**
(A)In all collisions momentum is conserved
(B)Both momentum and kinetic energy are conserved in glancing collision
(C)Kinetic energy is conserved in an inelastic collision but not in an elastic collision.
(D)The kinetic energy is transferred into other forms of energy during an inelastic collision

17. A ball of mass 4 kg falls on to the floor with a velocity of 4î - 9 ĵ m/s.It bounces off the floor with a velocity of 4î + 9 ĵ m/s. The ball changes direction in 0.15 s. What is the force exerted by the floor on the ball?
A. 480N ĵ B.-480 ĵ C.480 î D. -480 î

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18. A force is applied to a block to move it up a 30° incline. The incline is frictionless.
If F = 65N and M = 5.00 kg , what is the magnitude of the acceleration of the block?
Use $\sin 30^0 = 0.5$, $\cos 30^0 = 0.866$,



A)3.15 m/s^2

B) 6.3 m/s^2

C)2 m/s^2

D)5 m/s^2

19. Which of the following is ***false*** statement bout ***Collisions*** ?
(A)Head-on collision is a collision in one dimension, where the objects rebound on straight line paths that coincide with the original direction of motion.
(B)Glancing collision a collision in two dimensions, where the objects rebound in the same plane and necessarily the same direction as the original motion.
(C)Inelastic collision is a collision between two particles where kinetic energy is not conserved.
(D)Elastic collision is a collision between two particles where momentum and kinetic energy are conserved.

20. A is a sphere that is travelling with a velocity of $(3, 7)$ m/s and had a mass of 5 kg. It collides with sphere B and both particles move together with a velocity of $(1, 4)$m/s after the collision. Sphere B has a mass of 4 kg. What is the velocity of B before the collision?

A. $(1.5, -0.25)m/s$ C. $(1.5,\ 0.25)$m/s
B. C. $(-1.5,\ 0.25)$m/s D. $(-1.5, -0.25)$m/s

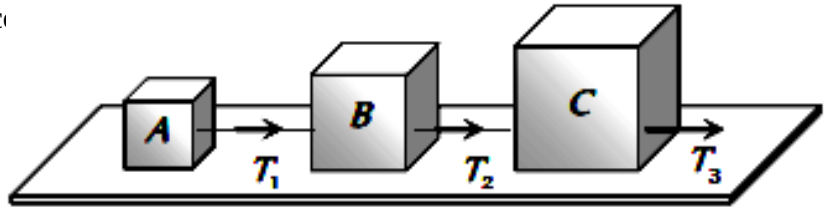
21. When a body is placed on a rough plane inclined at an angle θ to the horizontal, its acceleration is

(A) g $(sin\theta - cos\theta)$ B) $g(sin\theta - \mu cos\theta)$ (C) g $(\mu sin\theta - cos\theta)$ (D) gμ $(sin\theta - cos\theta)$

22. A 5kg mass pushed upward along an inclined plane of inclination 30^0 with constant force, F. If the acceleration the block for this motion is 1.0m/s^2 and the plane is assumed to be frictionless, what is the magnitude of the constant force F?

A.5.0N B. 25.0N C. 20.0N D. 30.0N

23. Three blocks A, B and C weighing 1kg, 8kg and 27 kg respectively are connected as shown in the figure with an inextensible string and are moving on a smooth surface. T_3 is equal to 36 N. Then What are T_2 and ac



(A) 18 N , 1m/s^2

(B) 9 N, 1m/s^2

(C) 3.375 N, 1m/s^2

(D) 1.25 N, 1m/s^2

24. A bar is 20 cm long. A 100 g mass is placed on one end and a 150 g mass on the other. Where is the balance point of the bar?

A. 8 cm from the 150 g mass and 12 cm from the 100 g mass.
B. 12cm from the 150 g mass and 8 cm from the 100 g mass.
C. 10 cm from the 150 g mass and 10 cm from the 100 g mass.
D. 8 cm from the 150 g mass and 10 cm from the 100 g mass.

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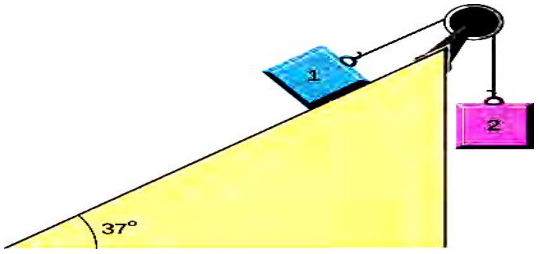
25. As shown below, the mass of block 1 is m_1 = 4. 0kg, while the mass of block 2 is m_2 = 8.0 kg. The coefficient of friction between m1 and the inclined surface is μ_k = 0.40. What is the acceleration of the system?

A)3.2 m/s^2

B)6 m/s^2

C)1.6 m/s^2

D)2.8 m/s^2



26. A large table has a mass of 150 kg. The coefficient of static friction between the table legs and the ground is 0.45. The coefficient of kinetic friction between the table legs and the ground is 0.4. What force is needed to keep the table moving? Use g = 9.8N/kg?

A. 588N B. 589N C. 587N D. 662N

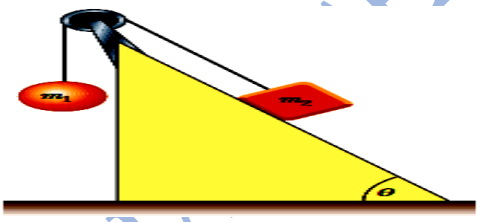
27. Two objects are connected by a light string that passes over a frictionless pulley, as in Figure BELOW If the incline is frictionless and if m1 = 2.00 kg, m2 = 6.00 kg, and θ = 53.0°, What are the accelerations of the objects, and the tension in the string?

A. 2m/s^2, 26N

B. 3.5 m/s^2, 24N

C. 7 m/s^2, 26N

D. 2 m/s^2, 36N



28. A roller coaster moves through a loop. At an angle of 60° to the bottom of the loop it has a velocity of 14 m/s. The mass of the roller coaster and riders is 750 kg. The diameter of the loop is 20 m. What is the force acting on the roller coaster at an angle of 60° to the bottom of the loop?

A. 14700N B. 3675N C. 11075N D. 18375N

29. The force of friction produced between surfaces in contact always acts

A. opposite to the direction of motion C. in the direction of motion

B. normal to the direction of motion D. All of the above

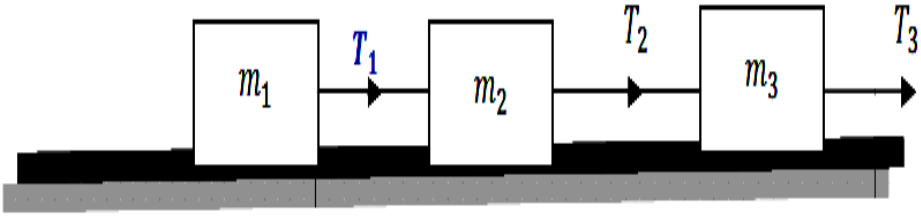
30. Three connected blocks are pulled to the right on a horizontal frictionless table by a force of magnitude T_3 = 40 N. If m_1 = 10kg, m_2 = 6 kg, and m_3 = 4kg, what will be the magnitude of the system's ***acceleration*** and the ***tension*** T_2 respectively?

A) 2m/s^2, 20N

B.) 2m/s^2, 32N

C . 2m/s^2, 40N

D)0. 2m/s^2, 32N



31. A block has been placed on an inclined plane .The slope angle θ of the plane is such that the block slide down the plane at a constant speed. ***The coefficient of kinetic friction*** is equal to

A. sin θ B. cos θ C. tan θ D. cot θ

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32. A ball of mass 4 kg falls on to the floor with a velocity of $\begin{bmatrix} 4 \\ -9 \end{bmatrix}$. It bounces off the floor with a velocity of $\begin{bmatrix} 4 \\ 9 \end{bmatrix}$m/s .The ball changes direction in 0.15 s. What is the force exerted by the floor on the ball?

A. $480N\hat{j}$ B. $-480N\hat{j}$ C. $72N\hat{j}$ D. $-72N\hat{j}$

33. A 0.50-kg object moves along the x-axis according to the function $\vec{X}(t) = 4t^3 + 2t - 1$, where x is in meters and t is in seconds. What is the magnitude of the net force acting on the object at time t = 2.0s?

A. 48 N B. 25 N C. 46 N D.24 N

34. A car of mass *m* is on an icy driveway inclined at an angle θ, assuming that the driveway is frictionless. Suppose the car is released from rest at the top of the incline, and the distance from the car's front bumper to the bottom of the incline is *d*. How long does it take the front bumper to reach the bottom,

A. $2gd \sin\theta$ B. $\sqrt{\frac{1}{2gd \sin\theta}}$ C. $\sqrt{\frac{2d}{g \sin\theta}}$ D. $\sqrt{2gd \sin\theta}$

35. A racetrack has a bend that is banked at an angle of 37^0 and has a radius of 100 m. A racing car has a mass of 800 kg and the coefficient of static friction between the tyres and the road surface is 0.6. What is the fastest speed the racing car can go round this bend?

36. A 3.00 kg particle has a velocity of (3.0i − 4.0j) m/s . Find the magnitude of its total momentum.

A. 5kgm/s B.30kgm/s C.10kgm/s D.15kgm/s

37. A projectile in flight explodes into several fragments. The total momentum of the fragments immediately after this explosion:

A. is the same as the momentum of the projectile immediately before the explosion

B .has been changed into kinetic energy of the fragments

C .is less than the momentum of the projectile immediately before the explosion

D .is more than the momentum of the projectile immediately before the explosion

38. A roller coaster moves through a loop. At an angle of 60° to the bottom of the loop it has a velocity of 14 m/s. The mass of the roller coaster and riders is 750 kg. The diameter of the loop is 20 m. What is the force acting on the roller coaster at an angle of 60° to the bottom of the loop?

A. 14700N B. 3675N C. 11075N D. 18375N

39. Newton's first law of motion describes the following [MP PMT 1996] (a) Energy (b) Work (c) Inertia (d) Moment of inertia

40. . If a bullet of mass 5 gm moving with velocity 100 m /sec, penetrates the wooden block upto 6 cm. Then the average force imposed by the bullet on the block is

(a) 8300 N (b) 417 N (c) 830 N (d) Zero

41. Newton's second law gives the measure of

(a) Acceleration (b) Force (c) Momentum (d) Angular momentum

42. Swimming is possible on account of

(a) First law of motion (b) Second law of motion

(c) Third law of motion (d) Newton's law of gravitation

43. Action and reaction forces act on

(a) The same body (b) The different bodies

(c) The horizontal surface (d) Nothing can be said

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44. The average resisting force that must act on a 5 kg mass to reduce its speed from 65 cm/s to 15 cm/s in 0.2s is

(a) 12.5 N (b) 25 N (c) 50 N (d) 100 N

45. An army vehicle of mass 1000 kg is moving with a velocity of 10 m/s and is acted upon by a forward force of 1000 N due to the engine and a retarding force of 500 N due to friction. What will be its velocity after 10 s

(a) 5 m/s (b) 10 m/s (c) 15 m/s (d) 20 m/s

46. A 30 gm bullet initially travelling at 120 m/s penetrates 12 cm into a wooden block. The average resistance exerted by the wooden block is

(a) 2850N (b) 2200 N (c) 2000N (d) 1800 N

47. . A cricket ball of mass 250 g collides with a bat with velocity 10 m/s and returns with the same velocity within 0.01 second. The force acted on bat is

(a) 25 N (b) 50 N (c) 250 N (d) 500 N

48. A force vector applied on a mass is represented as F = $6\hat{\imath}$ -8$\hat{\jmath}$+ 10$\hat{k}$and accelerates with 1m / s^2. What will be the mass of the body

(a) 10 $\sqrt{2}$ kg (b) 2$\sqrt{10}$ kg (c) 10 kg (d) 20 kg

49. During an INELASTIC collision, the colliding bodies

A. lose kinetic energy C. keep the same amount of kinetic energy

B. gains kinetic energy D. first lose, then gain kinetic energy

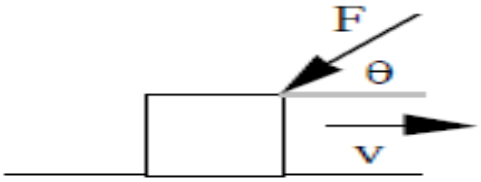
50. As shown in the accompanying figure, a force F is exerted at an angle of $\boldsymbol{\theta}$. The block of weight mg is initially moving the right with speed v. The coefficient of friction between the rough floor and the block is $\boldsymbol{\mu}$. The frictional force acting on the block is:

A. $\boldsymbol{\mu}$ mg to the left.

B. $\boldsymbol{\mu}$ mg to the right.

C. $\boldsymbol{\mu}$ (mg – F cos $\boldsymbol{\theta}$) to the right.

D. $\boldsymbol{\mu}$ (mg + F sin $\boldsymbol{\theta}$) to the left



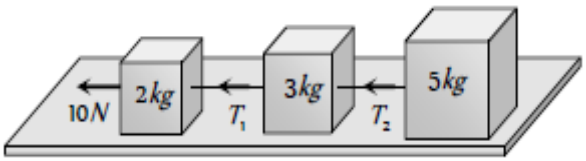
51. Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light string and are then placed on a frictionless surface as shown in the figure. The system is pulled by a force F = 10N, then tension T1 =

(a) 1N

(b) 5 N

(c) 8 N

(d) 10 N



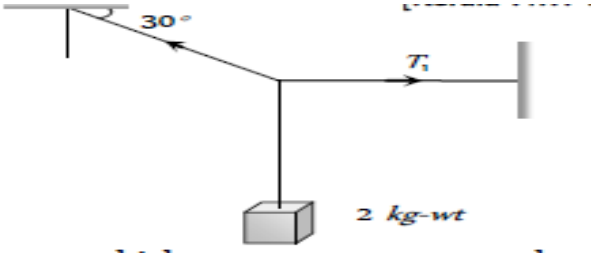
52. A body of weight 2kg is suspended as shown in the figure. The tension T1 in the horizontal string (in kg wt) is

(a) $\frac{2}{\sqrt{3}}$

(b) $\frac{\sqrt{3}}{2}$

(c) $2\sqrt{3}$

(d) 2



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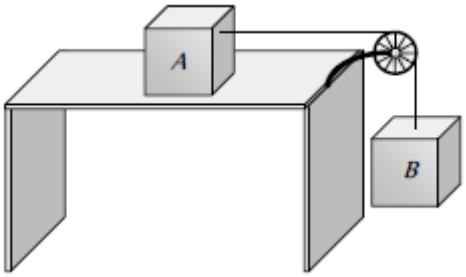
53. A block A of mass 7 kg is placed on a frictionless table. A thread tied to it passes over a frictionless pulley and carries a body B of mass 3 kg at the other end. The acceleration of the system is

(a) 100m/s^2

(b) 3 m/s^2

(c)10m/s^2

(d) 30 m/s^2



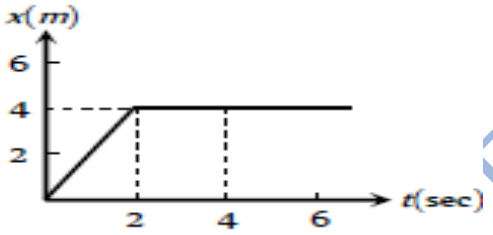
54. In the figure given below, the position-time graph of a particle of mass 0.1 Kg is shown. The impulse at t = 2 sec is

(a) 0.2 kg m/s

(b) -0.2 kg m/s

(c) -0.1 kg m/s

(d) 0.1 kg m/s



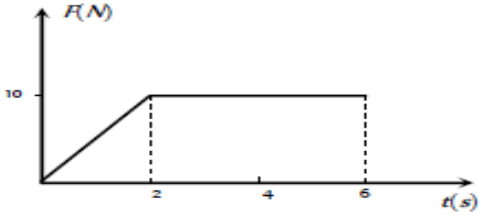
55. A body of mass 3kg is acted on by a force which varies as shown in the graph below. The momentum acquired is given by

(a) Zero

(b) 5 N-s

(c) 30 N-s

(d) 50 N-s



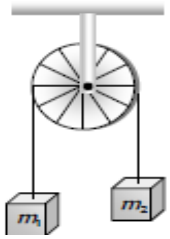
56. Two masses m1 and m2 are attached to a string which passes over a frictionless smooth pulley. When ,m_1 =10 kg , m_2 =6 kg the acceleration of masses is

(a) 20 m/s^2

(b) 5 m/s^2

(c) 2.5 m/s^2

(d) 10 m/s^2



57. Which is a suitable method to decrease friction

(a) Ball and bearings (b) Lubrication (c) Polishing (d) All the above

58. Maximum value of static friction is called

(a) Limiting friction (b) Rolling friction

(c) Normal reaction (d) Coefficient of friction

59. The maximum static frictional force is

(a) Equal to twice the area of surface in contact

(b) Independent of the area of surface in contact

(c) Equal to the area of surface in contact

(d) None of the above

60. Which of the following statements is not true

(a) The coefficient of friction between two surfaces increases as the surface in contact are made rough

(b) The force of friction acts in a direction opposite to the applied force

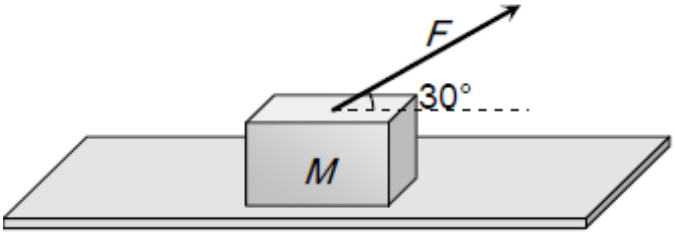
(c) Rolling friction is greater than sliding friction

(d) The coefficient of friction between wood and wood is less than 1

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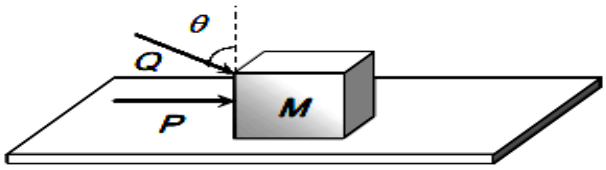
61. Which one of the following statements is correct?
(a) Rolling friction is greater than sliding friction
(b) Rolling friction is less than sliding friction
(c) Rolling friction is equal to sliding friction
(d) Rolling friction and sliding friction are same

62. A block of mass M = 5 kg is resting on a rough horizontal surface for which the coefficient of friction is 0.2. When a force F = 40 N is applied, the acceleration of the block will be
(a) 5.73 m /s^2
(b) 8.0 m /s^2
(c) 3.17 m /s^2
(d) 10.0 m /s^2



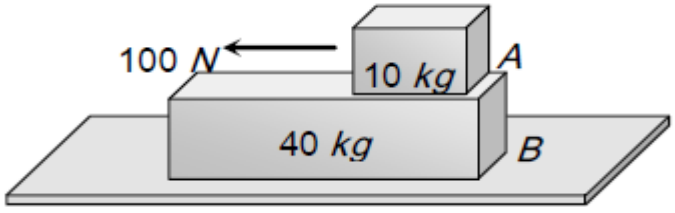
63. A block of mass m lying on a rough horizontal plane is acted upon by a horizontal force P and another force Q inclined at an angle θ to the vertical. The block will remain in equilibrium, if the coefficient of friction between it and the surface is

(a) $\frac{(P+Q\sin\theta)}{(mg+Q\cos\theta)}$
(b) $\frac{(P\cos\theta+Q)}{(mg-Q\sin\theta)}$
(c) $\frac{(P+Q\cos\theta)}{(mg+Q\sin\theta)}$
(d) $\frac{(P\sin\theta-Q)}{(mg-Q\cos\theta)}$



64. A block is kept on an inclined plane of inclination θ of length l .The velocity of the particle at the bottom of inclined is (the coefficient of friction is μ)?
A. $\sqrt{2gl\,(\mu cos\theta - sin\theta)}$ C.$\sqrt{2gl\,(sin\theta - \mu cos\theta)}$
B. $\sqrt{2gl\,(sin\theta + \mu cos\theta)}$ D. $\sqrt{2gl\,(cos\theta - \mu sin\theta)}$

65. A 40 kg slab rests on a frictionless floor as shown in the figure. A 10 kg block rests on the top of the slab. The static coefficient of friction between the block and slab is 0.60 while the kinetic friction is 0.40. The 10 kg block is acted upon by a horizontal force 100 N.
If g = 9.8 m/s^2 , the resulting acceleration of the slab will be
a) 0.98 m/s^2
(b) 1.47 m/s^2
(c) 1.52 m/s^2
(d) 6.1 m/s^2



66. A body is sliding down an inclined plane having coefficient of friction 0.5. If the normal reaction is twice that of the resultant downward force along the incline, the angle between the inclined plane and the horizontal is
(a) 15^0 (b) 30^0 (c) 45^0 (d) 60^0

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67. A body of mass 10 kg is lying on a rough plane inclined at an angle of 30^0 to the horizontal and the coefficient of friction is 0.5. the minimum force required to pull the body up the plane is

(a) 914 N (b) 91.4 N (c) 9.14 N (d) 0.914 N

68. A motorcycle is travelling on a curved track of radius 500m. If the coefficient of friction between road and tyres is 0.5, the speed avoiding skidding will be

(a) 50 m/s (b) 75 m/s (c) 25 m/s (d) 35 m/s

Assuming the coefficient of friction between the road and tyres of a car to be 0.5, the maximum speed with which the car can move round a curve of 40.0 m radius without slipping, if the road is unbanked, should be

(a) 25 m/s (b) 19 m/s (c) 14 m/s (d) 11 m/s

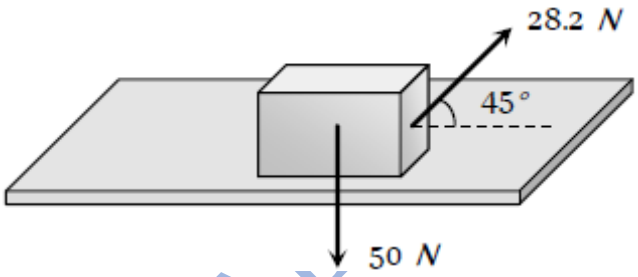
69. A body of weight 50 N placed on a horizontal surface is just moved by a force of 28.2 N. The frictional force and the normal reaction are

(a) 10 N, 15 N

(b) 20 N, 30 N

(c) 2 N, 3 N

(d) 5 N, 6 N



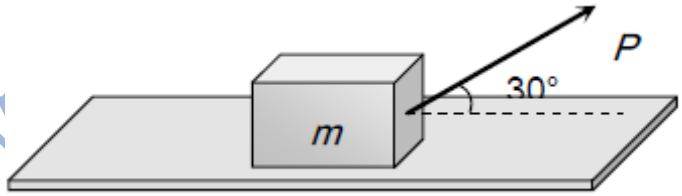
70. A body of mass m rests on horizontal surface. The coefficient of friction between the body and the surface is μ. If the mass is pulled by a force P as shown in the figure, the limiting friction between body and surface will be

(a) μmg

(b) $\mu\left[mg+\left(\frac{P}{2}\right)\right]$

(c) $\mu\left[mg-\left(\frac{P}{2}\right)\right]$

(d) $\mu\left[mg-\left(\frac{\sqrt{3}P}{2}\right)\right]$



71. A body of 5 kg weight kept on a rough inclined plane of angle 30o starts sliding with a constant velocity. Then the coefficient of friction is (assume g = 10 m/s^2)

(a) $^1/_{\sqrt{3}}$ (b) $^2/_{\sqrt{3}}$ (c) $\sqrt{3}$ (d) $2\sqrt{3}$

72. Particle A is traveling at a velocity of $\begin{bmatrix}6\\-2\end{bmatrix}$m/s. It collides with particle B which has a velocity of $\begin{bmatrix}5\\4\end{bmatrix}$m/s. The particles move together. The mass of Particle A 2kg and The mass of Particle B is 3kg. find the velocity of the combined particles after collision.

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