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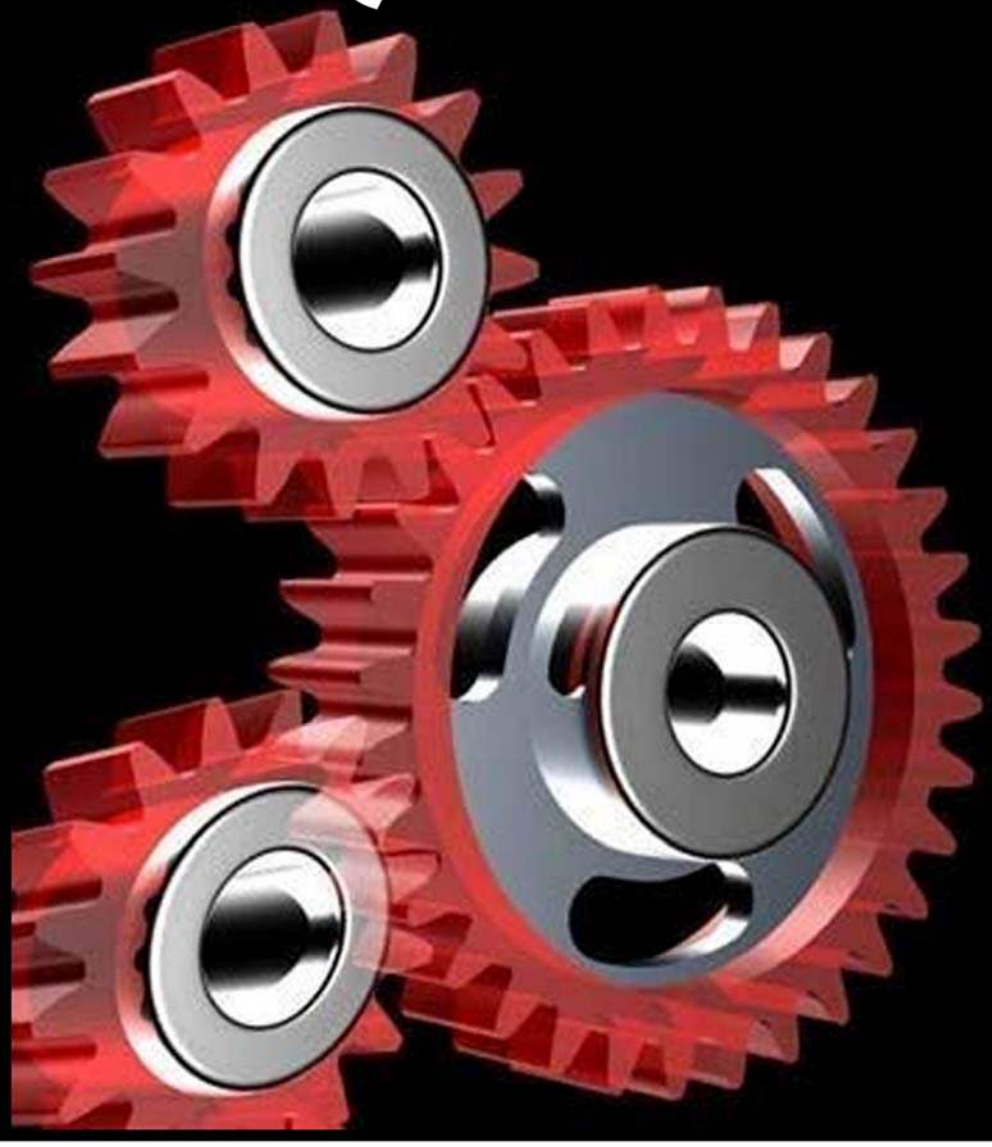
PREMIUM EBOOK

MECHANICAL APTITUDE TEST QUESTIONS



MECHANICAL APTITUDE TEST QUESTIONS

Welcome to our free mechanical aptitude test questions eBook. In this eBook we will cover 10 sample questions you might encounter in any mechanical aptitude test.

In a mechanical aptitude test, you might encounter questions in the following sections:

- Levers
- Maps
- Pulleys
- Electrical Circuits
- Gears
- Springs
- Tools

These tests may be encountered in multiple fields such as:

- Firefighting
- The Army
- Skilled Trades
- Police Officers

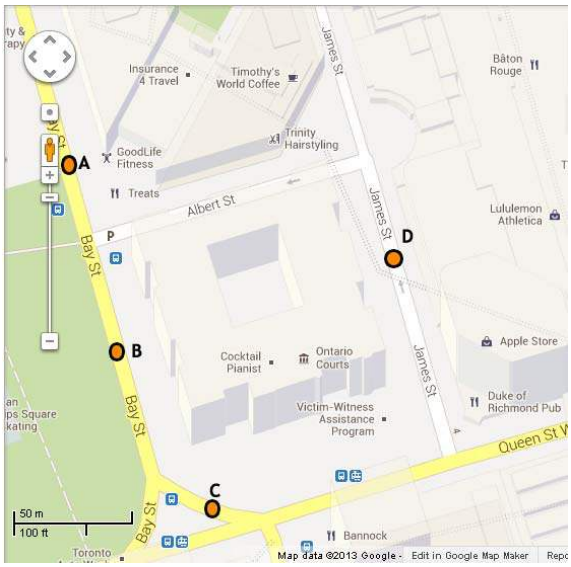
It's important to note that these questions are generic questions; questions that you will encounter on any type of mechanical aptitude test. Depending on the field of your test, there will be terms and specific questions pertaining to it. For example, if you are taking a mechanical aptitude test in the electrical trade, you can expect tools and electrical circuits specific to the electrical trade.

We at mechanicalaptitudetest.org hope you get great success from your future career.

PREMIUM TEST – 75 QUESTIONS

Section 1 - Maps

1-A person has moved straight forward to the North-West of the James St. road, and then he has turned left to the second intersection and walked towards South-East direction to reach the Trinity Hair Styling. From which point he has started his journey?

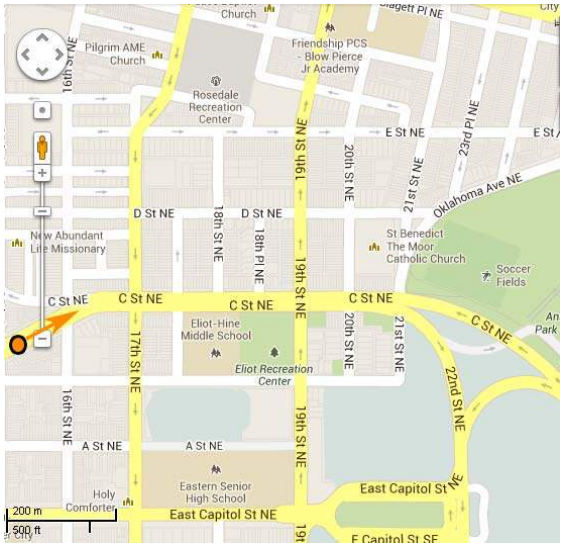


A. Point A
B. Point B
C. Point C
D. Pont D

2-A person stats walking from the south-east corner of the Carlton St road as shown in the figure. Then, at the first intersection he turns right, walks a little bit and then again turns left towards the North-East direction. Where is he now?

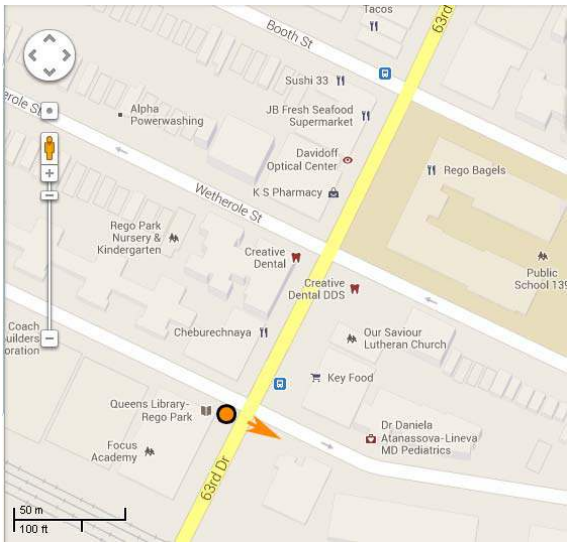
A. Security LLC
B. The Design Beacon
C. Perfect Dental Teeth
D. Golden Biz Opportunities

3-A boy has moved to USA from Germany to get his admission to the Eastern Senior High School. From the airport, he has reached to C St NE road. From the South-West corner, he has three options to move to the school. Which direction is the easiest way for him to move?



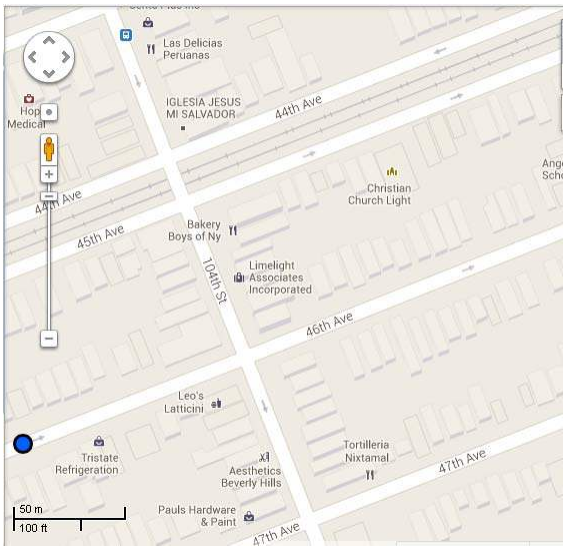
- **A.** Towards North-East, turn right at first intersection, at second intersection turn left
- **B.** Towards North-East, turn right at second intersection, at second intersection turn right
- **C.** Towards North-East, turn right at third intersection, at second intersection turn left
- **D.** Towards North-East, turn right at fourth intersection, at third intersection turn left

4- A person is in hurry to find out a pharmacy to manage some medicines. At Rego Park, he has asked another person about the direction of KS Pharmacy. But, the person misguided him with the wrong direction towards South-East from the park. What is the direction of KS pharmacy from that position?



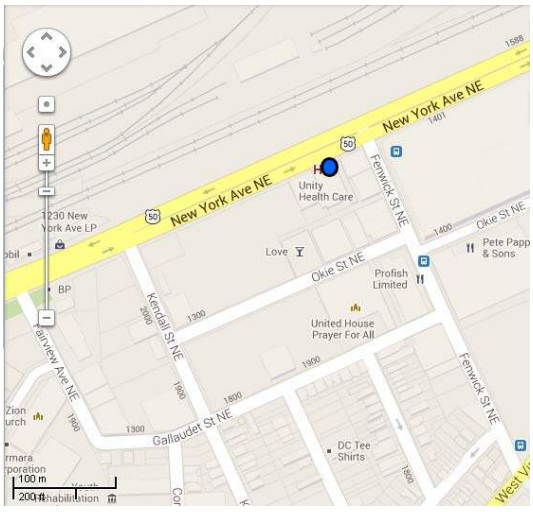
A. Turn back, move towards right of the 1st intersection, and walk a bit from 2nd intersection
B. Move straight, move towards left of the 1st intersection, and walk a bit from 2nd intersection
C. Turn right, move towards right of the 1st intersection, and walk a bit from 2nd intersection
D. Turn left, move towards right of the 2st intersection, and walk a bit from 3nd intersection

5-Assume that you have to meet with a client to receive a parcel. But, you don't know the name of the place expect street direction. From the south-west corner of the 46th Ave, you have to move towards left at 1st intersection, and then walking a bit you have to turn right before 1st intersection to get the desertion. Where do you have to meet with him?



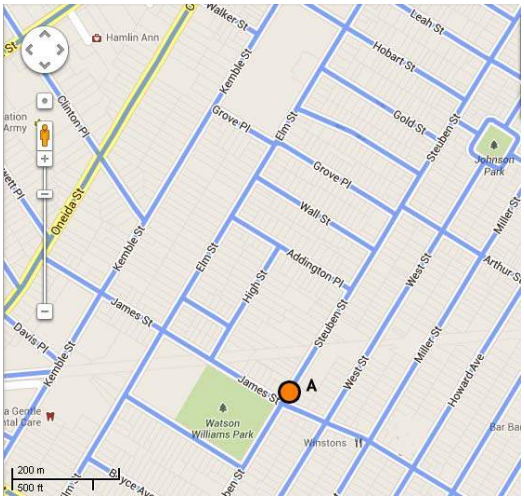
A. Nearby TortilleriaNixtamal
B. Nearby Bakery Boys of Ny
C. Nearby Christian Church Light
D. Nearby Leo's Latticini

6-A mentally sick patient has run out from the Unity Health Care Center without other's concern. Due to security reason a GPS indicator was placed in his body that shows that he has moved towards the north-east, then turning right at 1st intersection he has started moving towards south-east and crossing the 1st and 2nd intersection he has stopped running. What is his location now?



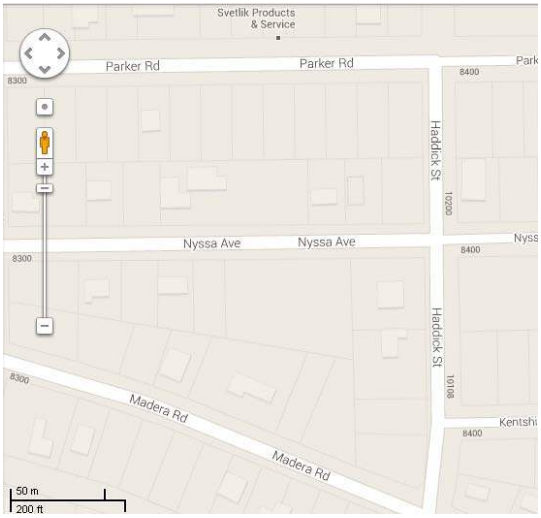
A. Profish Limited
B. United House Prayer for All
C. DC Tee Shirts
D. Love

7-A tourist has visited Watson Williams Park, and then he wants to move to Johnson Park. If his present location becomes A, then how many intersections needs to be counted to reach to the Johnson Park?



A. 7 intersections.
B. 12 intersections
C. 5 intersections
D. 11 intersections

8-From your current position you have to move to the left towards north, then after crossing 3 intersections you have to you have to turn left at the 4th intersection to reach Svetlik Products & Service. What is your current location?



A. Madera Rd
B. Nyssa Ave
C. Haddicks St
D. Parker Rd

9-A driver is carrying a boy towards east of the Way St road to send him to the OK Korral Montessori School. What would be his direction to reach there?

A. Turn left at 1st intersection, move straight, and then turn right at the 2nd intersection

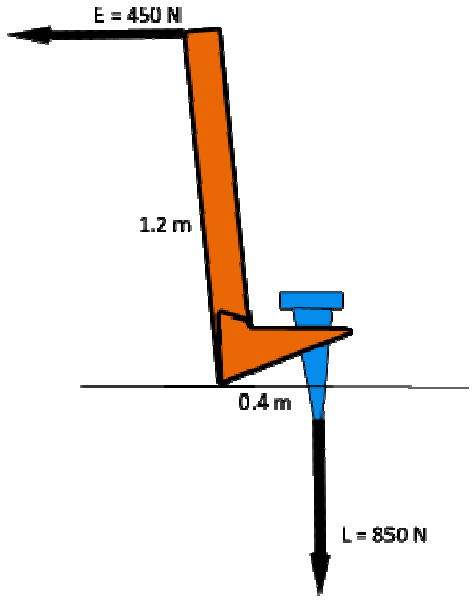
B. Turn left at the 2nd intersection, move straight, and then turn right at the 2nd intersection

C. Turn left after crossing 2nd intersection, move straight, and then turn left at the 3rd intersection

D. Turn right after crossing 1nd intersection, move straight, and then turn left after at the 2nd intersection

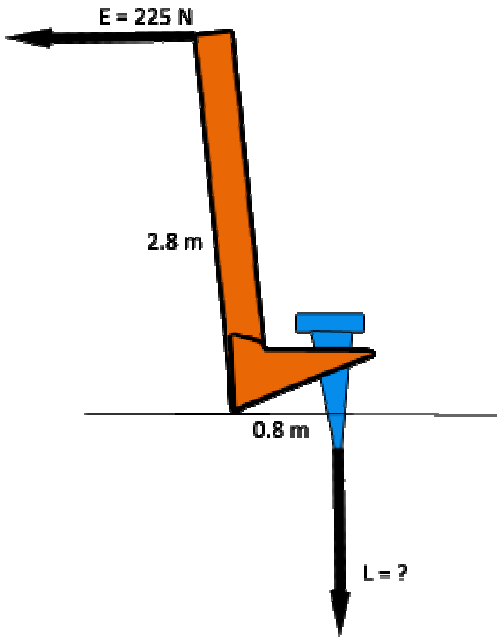
Section 2 - Levers

10-The figure demonstrates the action of a simple crowbar that is 1.2 m in length. The load is at 0.4 m distance from the fulcrum point. At the top of the crowbar an effort of 450 N is applied to move the load of 850 N. What are the values of its velocity ratio, mechanical advantage, and efficiency?



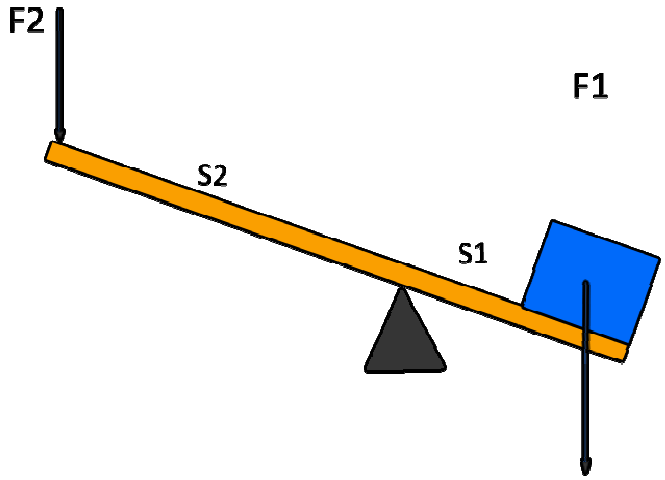
A. VR = 1.5, MA = 2.36, E = 85.79%
B. VR = 2.5, MA = 4.67, E = 75.25%
C. VR = 1, MA =0, E = 45%
D. VR = 3, MA = 1.88, E = 62.66%

11-A force of 225 N is applied to remove a pin from a wooden board as shown in the figure. If the length of the crowbar becomes 2.8 m and distance between load center and fulcrum becomes 0.8 m, then what is the value of that load? [Here, the efficiency of the crowbar is 75%]



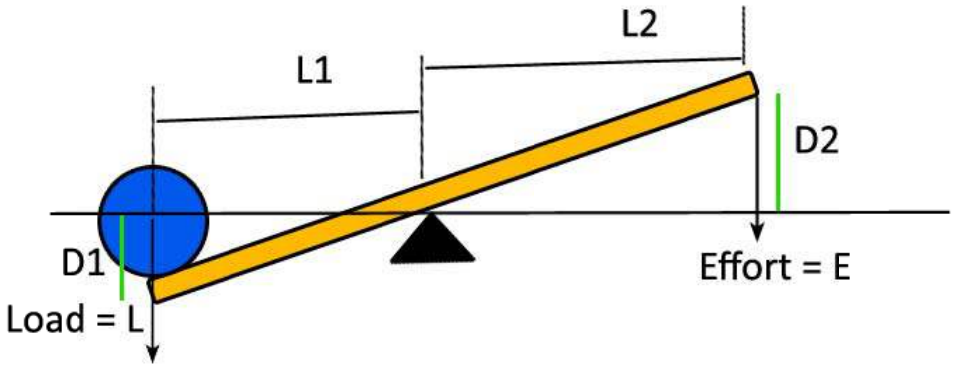
A. L = 590.625 N
B. L = 425 N
C. L = 600 N
D. L = 450.25 N

12-A lever is used to lift an object of load F_1 that requires F_2 effort on the other end. If the distance between load and fulcrum becomes S_1 and distance between effort and fulcrum becomes S_2, then which one of the following is correct to expression for its work balance equation?



A. $F_1 \times S_1 = F_2 \times S_2$
B. $(F_1 \times S_1)/ F_2 = (F_2 \times S_2)/F_1$
C. $2F_1S_1 = F_2/ S_2$
D. $F_1/S_1 = F_2/ S_2$

13-A lever is used to move a metal ball as shown in the figure. If lengths of lever on both working ends from the fulcrum point becomes L_1, L_2 and distances on both ends becomes D_1 and D_2, then the relationship equation can be expressed as $L_2/ L_1 = D_2/ D_1$. Which one of the following assumptions is correct from this statement?

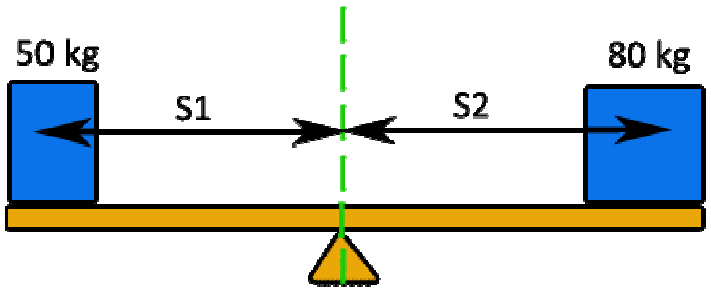


A. Lengths are proportional to the distances of each end
B. Work done is proportional to acceleration
C. Effort is directly proportional to velocity ratio
D. Mechanical advantage is zero here

14-Assume that a lever is used to lift a stone piece, whose larger length is 85 inches on one side of the fulcrum, and 15 inches on other end. After applying the force, the larger end moves 25 inches. So, how far does the shorter end of the lever move?

A. 3.50 inches
B. 6.05 inches
C. 4.41 inches
D. 3.25 inches

15-Two loads of 50 kg and 80 kg are loaded on both ends of a wooden bar that is supported by a fulcrum at distances S_1 and S_2 from both ends of the lever. If the value of distance S_1 becomes 10 m, then at which length of S_2 the wooden bar will remain in balanced condition?



A. S_2 = 15.65 m
B. S_2 = 62.5 m
C. S_2 = 74.2 m
D. S_2 = 6.25 m

16- A person is trying to move a wooden block of 650 lb with a lever of 10 ft long. If the lever is positioned on a fulcrum at the distance of 3 ft from this load, then what will be the value of effort required to lift this wooden block?

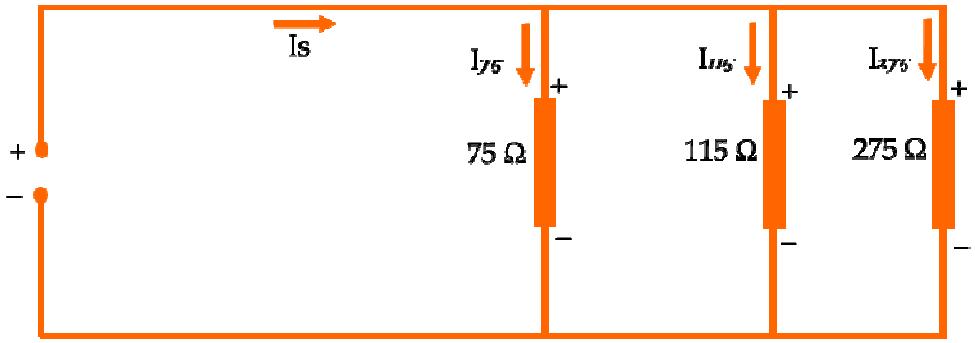
A. F_2 = 171.42 lb
B. F_2 = 345.07 lb
C. F_2 = 278.51 lb
D. F_2 = 231.19 lb

17-You have to lift a load of 250 lb with a 3 ft long lever. But, you are not strong enough to lift that load. So, the length of the lever is increased 9 more feet to increase the mechanical advantage, and a fulcrum is placed 3 ft apart from the load. How much effort do you require to lift that load?

A. F_2 = 46.98 lb
B. F_2 = 83.33 lb
C. F_2 = 33.19 lb
D. F_2 = 55.25 lb

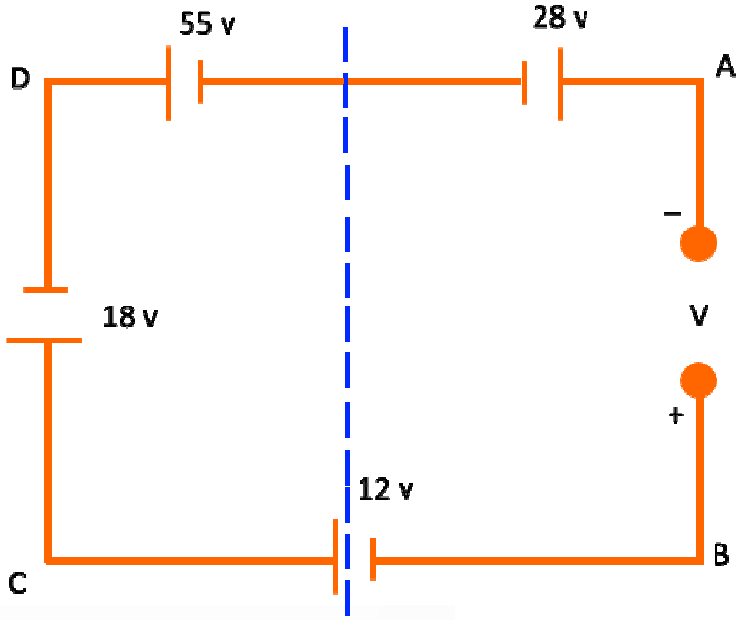
Section 3–Electrical Circuits

18-The following circuit shows the Kirchhoff's law in action, where three resistors are in parallel connection. If the resistance of these three resistors becomes 75 Ω, 115 Ω, and 275 Ω, then calculate the current through each resistor. [Where the source voltage is 120 V]



A. I_{75} = 3.3 amps, I_{115} = 5.6 amps, I_{275} = 2.66 amps
B. I_{75} = 1.2 amps, I_{115} = 5.55 amps, I_{275} = 2.59 amps
C. I_{75} = 1.6 amps, I_{115} = 1.04 amps, I_{275} = 0.44 amps
D. I_{75} = 5.9 amps, I_{115} = 7.89 amps, I_{275} = 1.33 amps

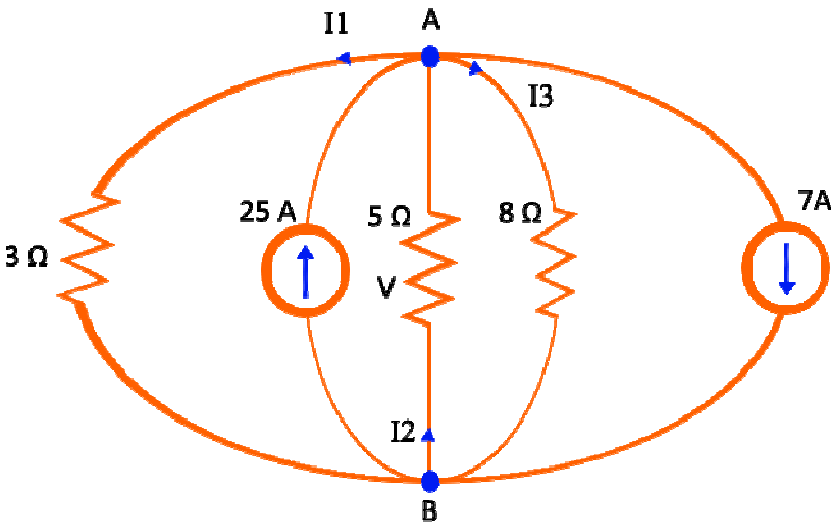
19-Following figure illustrates an electrical circuit connection where four sources are connected in a series connection with an open switch. Calculate the voltage V at the open switch point starting from point A in the clockwise direction.



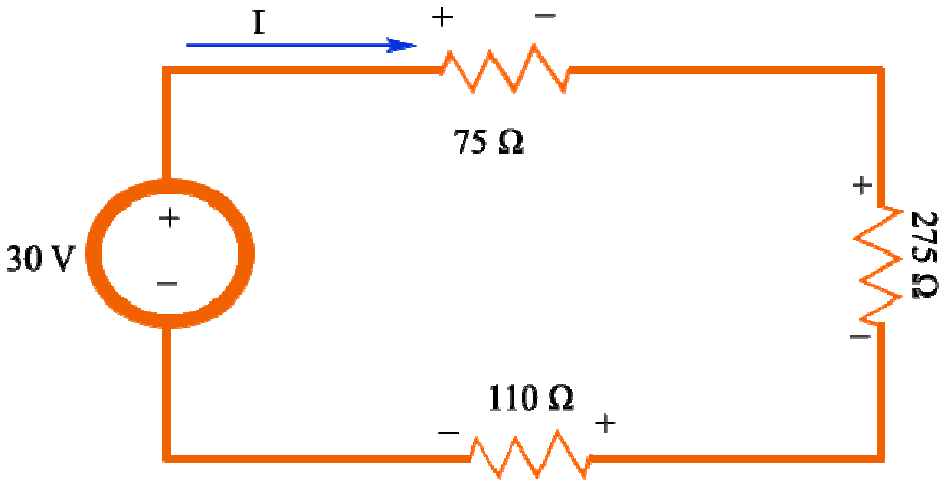
A. V = 33 volts
B. V = 65 volts
C. V = 25 volts
D. V = 11 volts

20-In the following circuit diagram the directions of current I_1, I_2, and I_3 are arbitrarily chosen. Which one will be the value of voltage V? [Applying the Ohm's Law and Kirchhoff's Current Law]

A. V = 13.29 volts
B. V = 24.56 volts
C. V = 75.24 volts
D. V = 69.76 volts

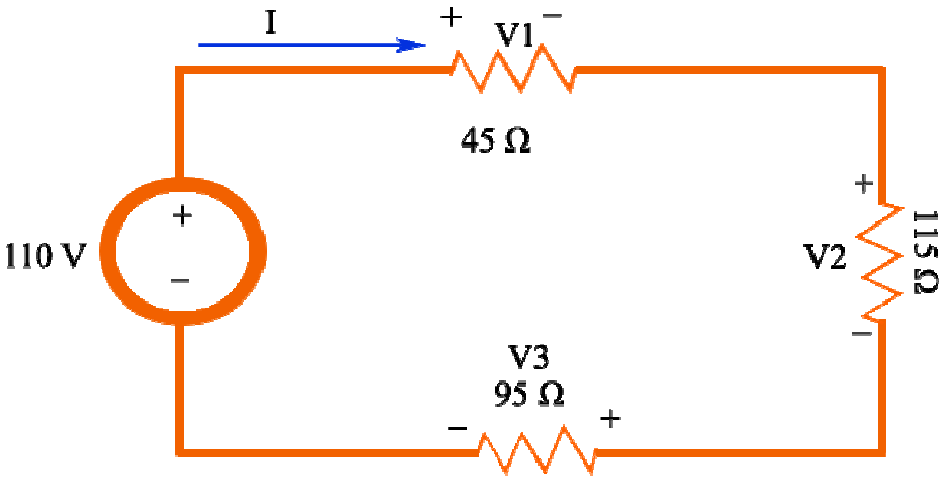


21-In an electrical circuit, there three resistors of 75 Ω, 275 Ω, and 110 Ω are in series connection. If voltage drop on each segment becomes V_1, V_2, V_3, then calculate the current of this circuit? [Apply Kirchhoff's voltage law]



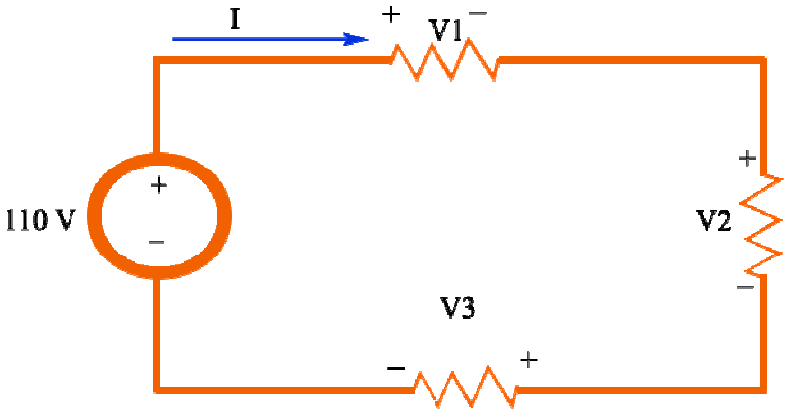
A. I = 0.887 A
B. I = 0.065 A
C. I = 0.125 A
D. I = 0.089 A

22-If three resistors of 45 Ω, 115 Ω, and 95 Ω are connected to a source of 110 V, then how much power does this circuit connection dissipate in the source?



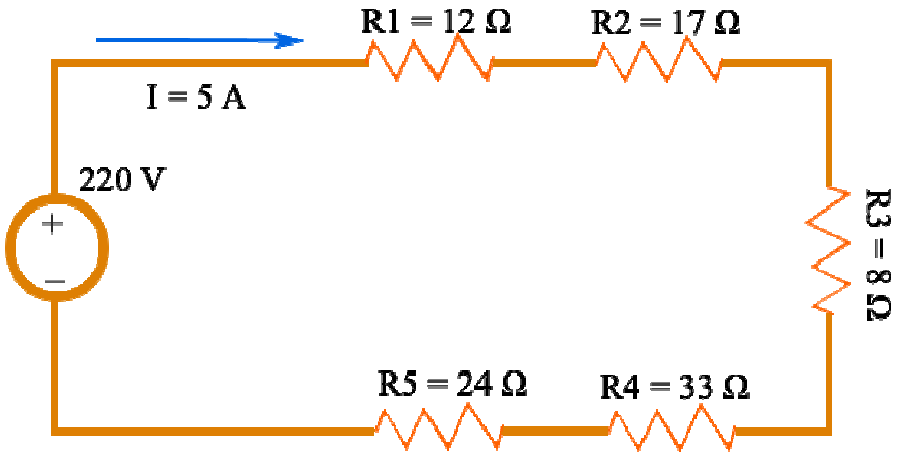
A. P = 25.55 watts
B. P = 110.3 watts
C. P = 47.3 watts
D. P = 65.9 watts

23-In any electrical circuit, you can easily determine the voltage drop across any resistor by a voltmeter. In the following circuit connection, how should you fix the voltmeter to determine the voltage V_2?



A. In parallel to V_2
B. In Series to V_2
C. In parallel to the source
D. In series to V_1

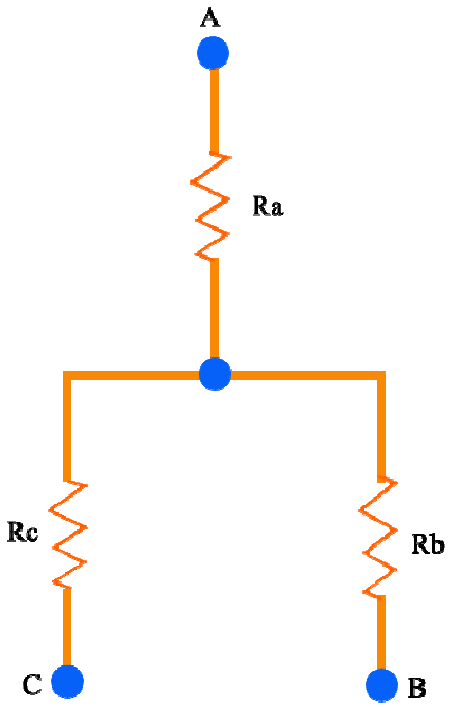
24-The following figure illustrates a simple circuit completed with a series of five resisters and a source. What is the equivalent resistance value that can be placed in this circuit connection instead of these five individual resistors?



A. R = 1.95 Ω
B. R = 94 Ω
C. R = 75 Ω
D. R = 0.34 Ω

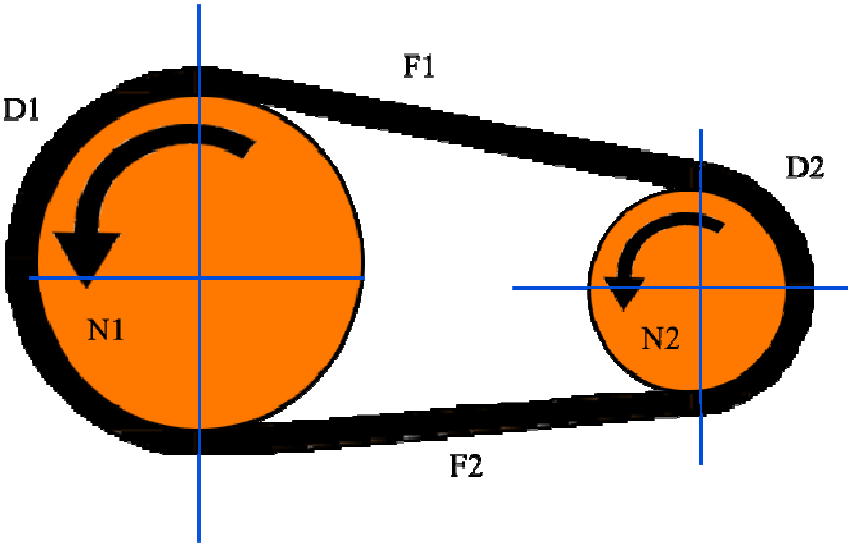
25-The figure represents a simple Wye connection. If the values of these three resistors become Ra = 12 Ω, Rb = 15 Ω, and Rc = 35 Ω, then what will be the resulting resistance across AB?

A. R_{ab} = 13 Ω
B. R_{ab} = 35 Ω
C. R_{ab} = 27 Ω
D. R_{ab} = 42 Ω



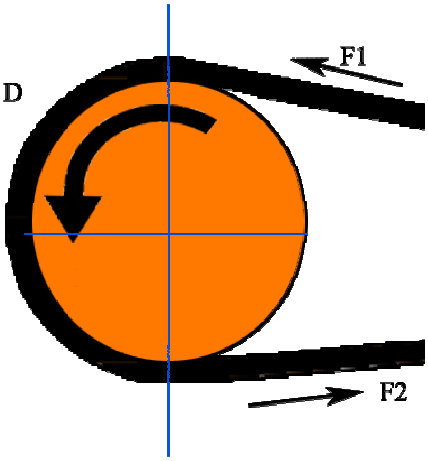
Section 4–Pulleys

26-Assume two wheels are connected by a pulley belt. If the tangential velocity of both pulleys becomes same and also the velocity of the belt, then which one of the following relationship equations is correct?



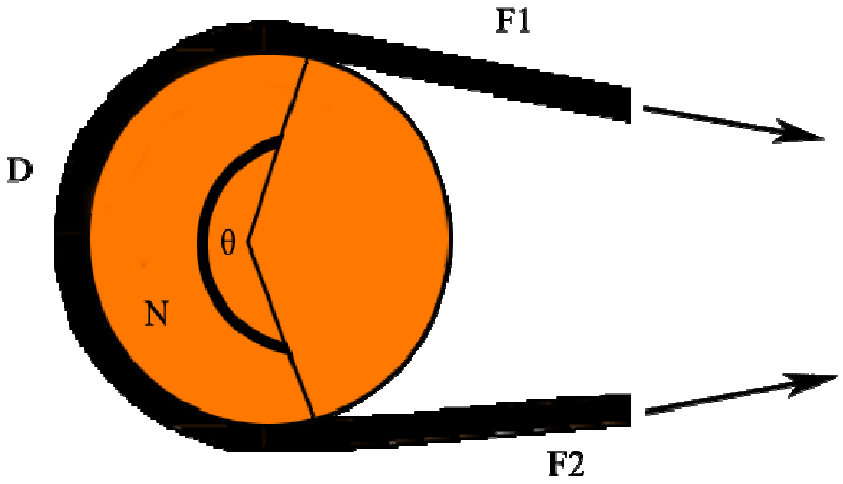
A. $N_1/ N_2 = (D_1/ D_2)$
B. $N_1/ N_2 = D_2/ D_1$
C. $N_1/ 2N_2 = (D_2/ D_1)^2$
D. $N_1N_2 = D_2/ D_1$

27-In a simple belt-pulley arrangement, assume that two opposition forces are F_1 and F_2. How can you calculate the net power transmitted by this pulley arrangement?



A. $P = (F_1 – F_2)/2D$
B. $P = \pi D/ 2F$
C. $P = \pi D (F_1 + F_2)$
D. $P = \pi DN (F_1 – F_2)$

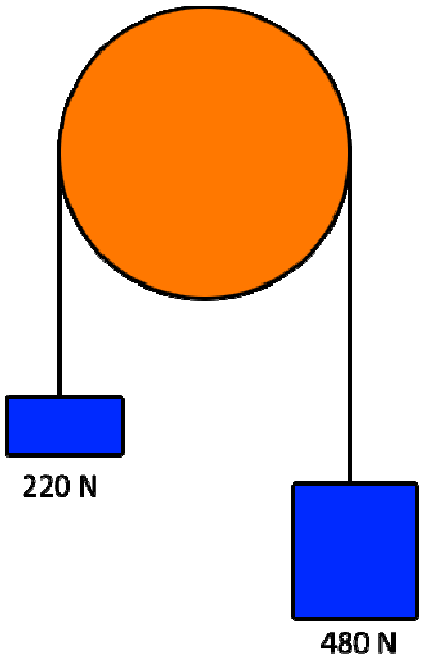
28-The following figure illustrates a belt-pulley arrangement, where two active forces are F_1 and F_2. If the lap angle becomes θ and the belt frictional coefficient becomes μ, then which one of the following equations is valid to define the relationship between these two forces?



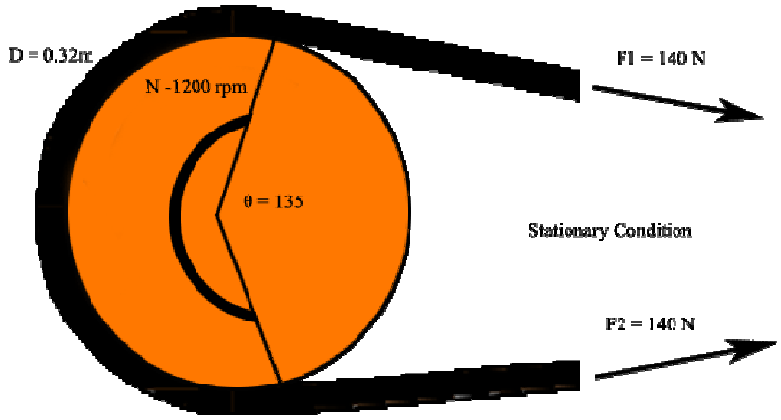
A. $F_1/ F_2 = e^{\mu\theta}$
B. $2F_1F_2 = 1/ e^{\mu\theta}$
C. $F_1/ F_2 = 1/ e^{\mu\theta}$
D. $F_1F_2 = 2\theta e^{\mu}$

29-A steel wire is hung over a stationary pulley drum as shown in the figure. Two ends of the rope contain two weights of 220 N and 480 N. What is the value of co-efficient of friction here?

A. μ = 0.649
B. μ = 0.441
C. μ = 0.981
D. μ = 0.248



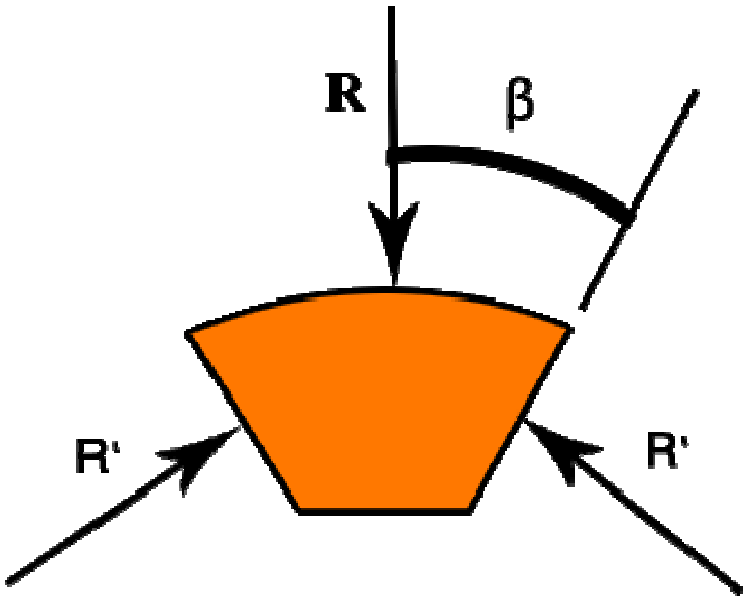
30-A pulley of 0.32 m is running with the speed of 1200 rmp. When this pulley remains stationary, then tension on the belt estimates 140 N. If the lap angle of the belt and pulley becomes 135°, then what will the values of tension in each side, and transmitter power when the belt is subjected to slip on the smaller wheel? [Assume, coefficient of friction is 0.28]



A. F_1 = 355.673 N, F2 = 122.87 N, P = 1436.917 W
B. F_1 = 129.89 N, F2 = 134.97 N, P = 1898.923 W
C. F_1 = 184.43 N, F2 = 95.57 N, P = 1786.619 W
D. F_1 = 255.67 N, F2 = 156.89 N, P = 1680.98 W

31- Assume that a V-belt is in action with two active forces F_1 and F_2. If the belt angle becomes β and the lap angle becomes θ, then how can you relate these two active forces F_1 and F_2? [Consider coefficient of friction μ]

A. $F_1/F_2 = e^{(\text{Sin}\,\beta/\,\mu\theta)}$
B. $F_1/F_2 = e^{\text{Sin}\beta}$
C. $F_1/F_2 = e^{2\mu\theta}$
D. $F_1/F_2 = e^{(\mu\theta/\,\text{Sin}\,\beta)}$



32-A V-belt is running a pulley drum, where the centrifugal force is F_c, and another force F_1 is acting to create torque in the pulley drum. How can you calculate the power transmitted by a V-belt?

A. $P = 2V (1- e^{-\mu\theta})$
B. $P = V (F_1 + F_c) e^{-\mu\theta}$
C. $P = V (F_1 – F_c) (1- e^{-\mu\theta})$
D. $P = (F_1 – F_c)/ (1- e^{-\mu\theta})$

33-Assume that a pulley system uses a V-belt, where the lap angle is 145^o. The cross sectional area of the belt is 0.00045 m^2 and density is 1150 kgm^{-3}. If the maximum force allowed to the belt becomes 580 N, then how much power will be transmitted by this belt that is running with the speed of 8 m/s. [Assume, coefficient of friction is 0.28 and centrifugal force is considered]

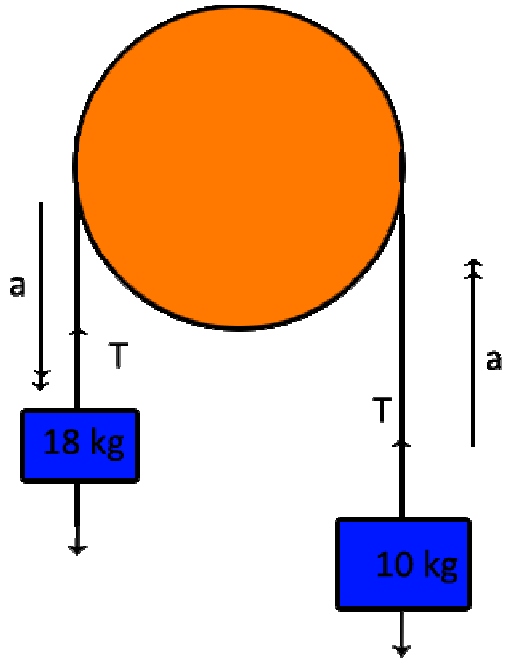
A. P = 1132.098 watt
B. P = 2897.854 watt
C. P = 1160.215 watt
D. P = 2220.632 watt

34-A belt-pulley system uses a belt of density 850 kgm^{-3} and cross sectional area 0.00038 m^2, where maximum allowed force is 480N. If the lap angle and coefficient of friction becomes 140^o and 0.28 accordingly, then calculate the speed at which its maximum power occurs?

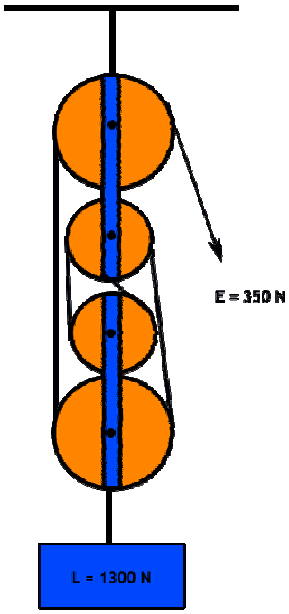
A. V = 36.981 ms^{-1}
B. V = 22.256 ms^{-1}
C. V = 12.097 ms^{-1}
D. V = 24.643 ms^{-1}

35-Assume, a light inextensible string passes over a pulley. On both ends of the string, there are loads of mass 18 kg and 10 kg. If these two loads are released from the rest, then what will be value of tension T?

A. T = 126.1 N
B. T = 568.9 N
C. T = 113.5 N
D. T = 264.1 N

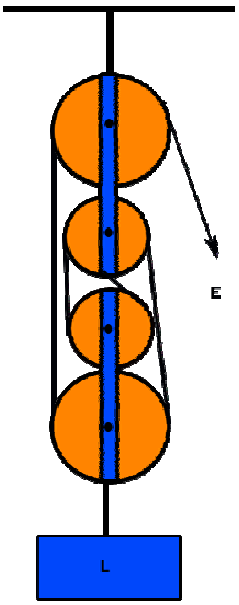


36-If the effort of a simple pulley system becomes 350 N and the total load becomes 1300 N, then what will be its mechanical advantage?



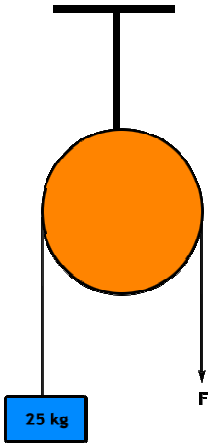
A. MA = 3.71
B. MA = 2.76
C. MA = 6.45
D. MA = 9.15

37-The following figure illustrates a simple pulley arrangement of 4 sections. What is the velocity ration of that pulley arrangement?



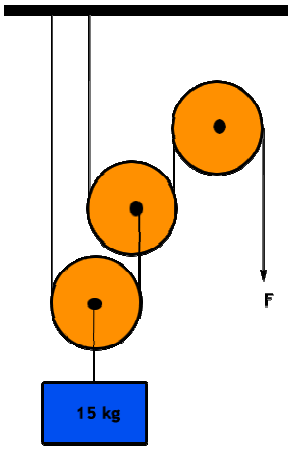
A. 3
B. 4
C. 6
D. 8

38- A 1:1 pulley is arranged to reduce the lifting force of a mass of 25 kg. Calculate the reaction force R?



A. R = 490.5 N
B. R = 550.5 N
C. R = 113.1 N
D. R = 325.6 N

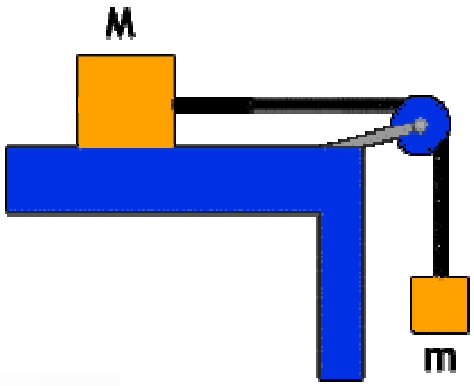
39-The figure illustrates a 4:1 pulley arrangement that contains a mass of 15 kg. Calculate the applied force F to lift this mass up?



A. F = 75.25 N
B. F = 36.78 N
C. F = 56.98 N
D. F = 15.66 N

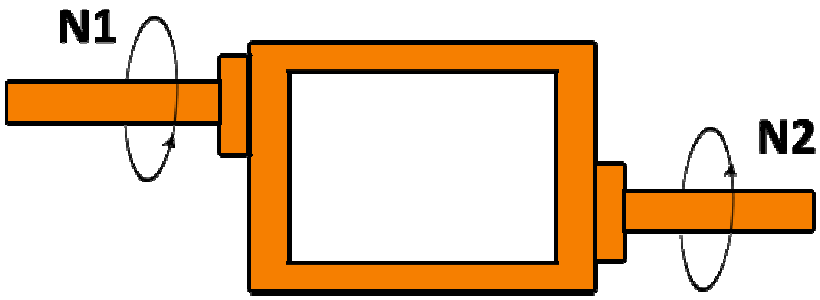
40-If a pulley system works on a table, where two masses are M and m, then what will be the correct equation for frictional force F_f? [Assume that Normal force is N and frictional coefficient is μ]

A. $F_f = \pi N/ \mu$
B. $F_f = \mu N$
C. $F_f = 4\mu N^2$
D. $F_f = \mu/N$



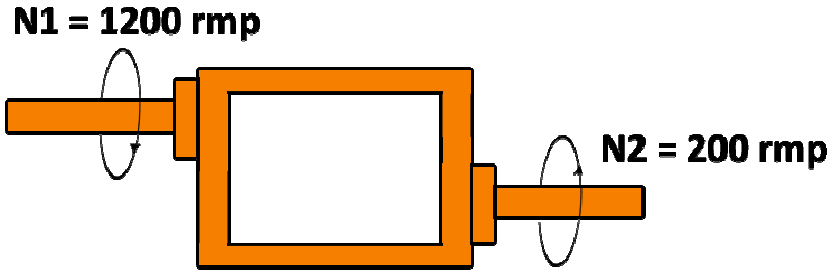
Section 5 - Gears

41-The figure illustrates a simple gear box arrangement, where input speed is N_1 and output speed is N_2. Which one of the followings defines the gear box ratio GR?



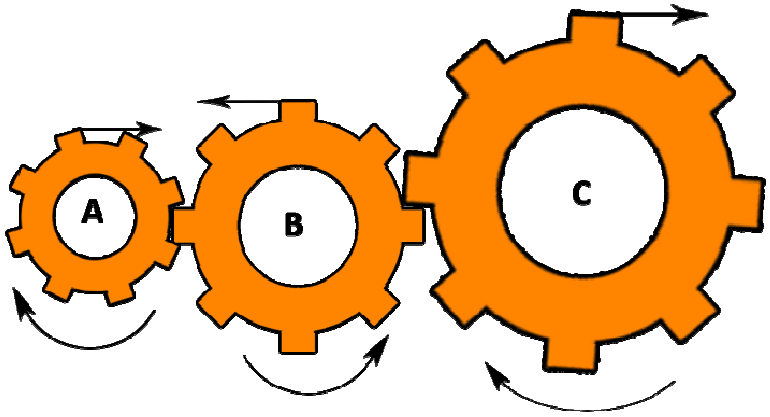
A. GR = N_1/ N_2
B. GR = $\pi N_1 N_2$
C. GR = $½\pi N_1/ N_2$
D. GR = $2N_1N_2$

42-Assume that a gear box is fixed with an engine output, where the input speed of the gear box is 1200 rpm clockwise and output speed is 200 rpm anticlockwise. If the input power becomes 30 KW and efficiency becomes 70%, then what is its output power?



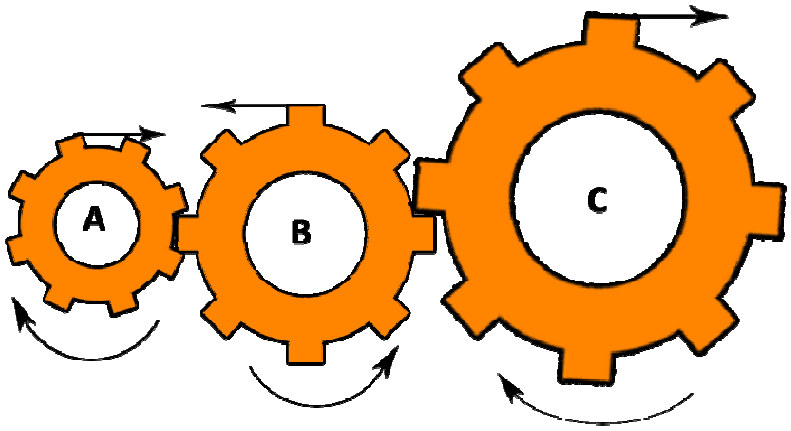
A. 26 KW
B. 35 KW
C. 15 KW
D. 21 KW

43-In a gear arrangement, there are three gears A, B, and C in action. These three gears are running with the speed of N_A, N_B, and N_c. If the A gear becomes the input gear and C becomes the output gear, then what will be the gear ratio here for this arrangement?



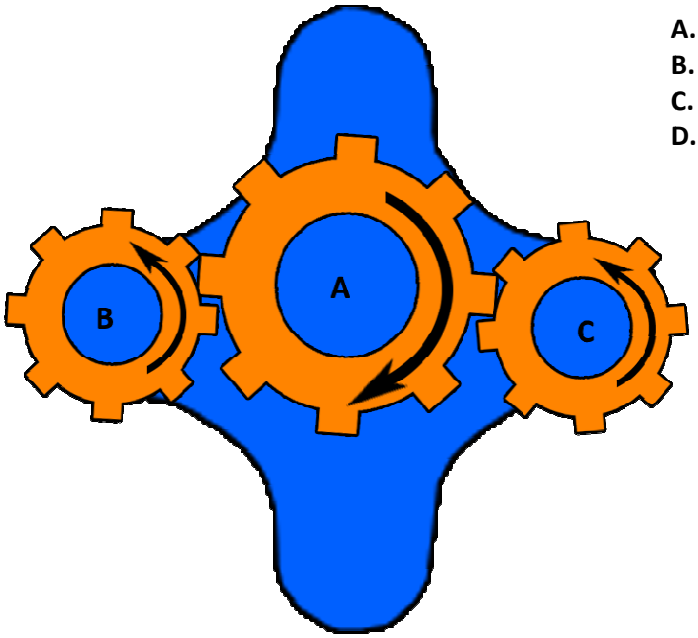
A. GR = N_A/ N_B
B. GR = N_B/ N_c
C. GR = N_A/ N_c
D. GR = N_C/ N_A

44-The figure illustrates a simple gear train of 3 gears. Assume the gear A has 40 teeth and the gear C has 120 teeth. If the input gear A rotates with the speed of 1200 rpm clockwise, then what will be the values of gear ratio and output speed?



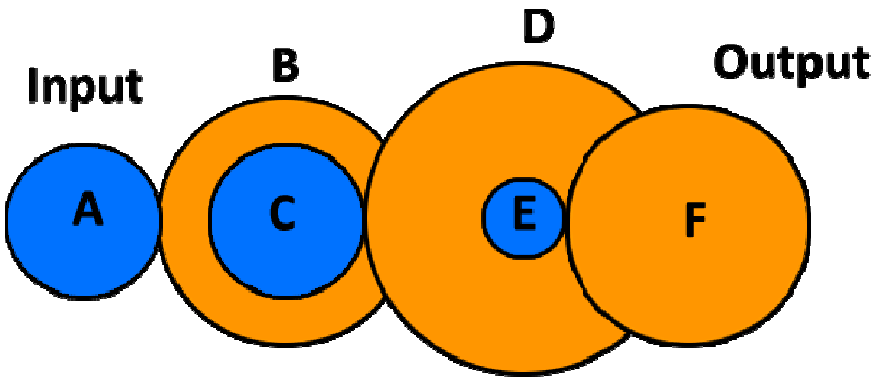
A. GR = 3, N_c = 400 rpm
B. GR = 2, N_c = 150 rpm
C. GR = 4, N_c = 800 rpm
D. GR = 5, N_c = 500 rpm

45-The figure illustrates a planetary gearing system with different gear components. How could you define the central gear A?



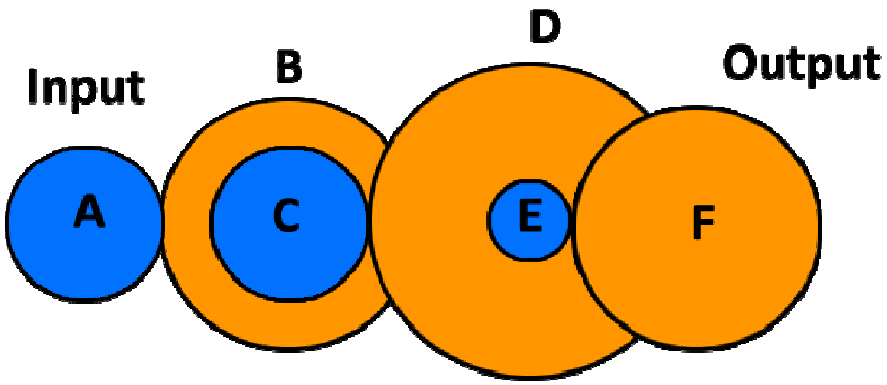
A. Sun Gear
B. Planetary Gear
C. Annuals
D. Carrier

46-The figure illustrates a compound gear chain, where the gears A, B, C, D, E, and F have 20, 80, 40, 80, 10, and 80 teeth accordingly. Which one is the correct gear ratio for that compound gear chain?



A. GR = 45
B. GR = 24
C. GR = 75
D. GR = 64

47-Assume that a compound gear chain is arranged with six gears of A, B, C, D, E, and F, where A is the input gear and F is the output gear. If this input gear rotates clockwise, then what will be the direction of rotation for the output gear F?



A. Anti Clockwise
B. Clockwise
C. Remains Steady
D. No rotation occurs

48-Assume that a gear box has an input speed of 900 rpm clockwise and output speed of 150 rpm anticlockwise. If the input power becomes 20 KW, then what will be the value of its input torque?

A. T_1 = 133.55 N-m
B. T_1 = 212.31 N-m
C. T_1 = 125.23 N-m
D. T_1 = 513.67 N-m

49- In the input section of a gear system, there is a spur gear with high speed. If you need to reduce the speed in the output section by a considerable amount, then what type of gear would you prefer?

A. Spur Gear
B. Bevel Gear
C. Herringbone Gear
D. Worm Gear

50-The figure illustrates a herringbone gear that has V-type teeth arrangement. For this type of gear, which statement is valid?

A. Double helical gear
B. Double worm gear
C. Double bevel gear
D. Double girth gear

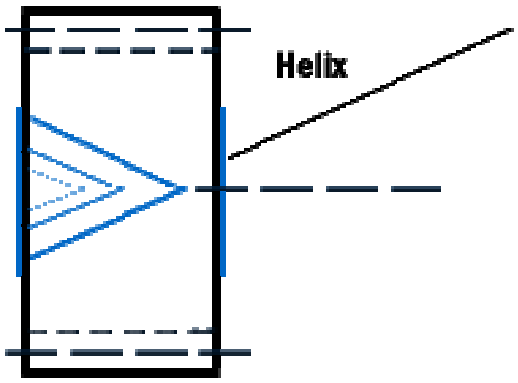
51-Practically, spur gears widely used in heavy industries, where it requires a simple power transmission arrangement as shown in the figure. Which statement is true for its perfect mesh?

A. Fitted with parallel axles
B. Fitted with series axles
C. Fitted at the angle of 13^{o}
D. Fitted at the angle of 33.31^{o}

52-The figure shows a herringbone gear. Which statement is correct for the mesh up of herringbone gears?

A. Gears must have same pressure angle and pith
B. Gears must have same pressure angle and different pitch
C. Gears must have same pitch and different pressure angle
D. Gears must have pressure angle equals to zero

53-There are two acting angles in a simple herringbone gear, and these are pressure angle and helix angle. Which statement is correct to define the helix angle of a herringbone gear?



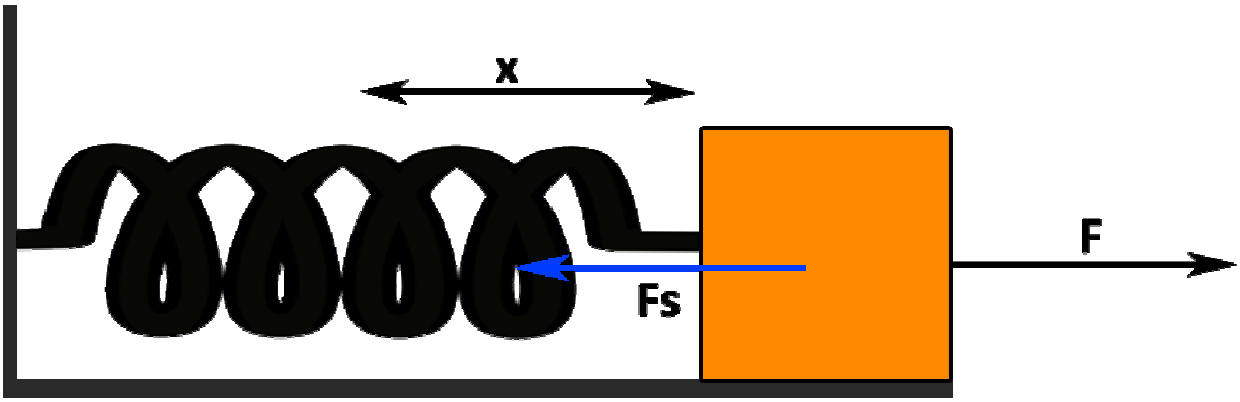
A. The teeth alignment angle as compared to the axis
B. The shaft positioning angle as compared to y axis
C. The axle rotation angle
D. The main pitch angle

54-Pitch angle of a herringbone gear is also known as the tooth drive action angle. What is the typical pressure angle for a simple herringbone gear?

A. 13 or 25
B. 14.5 or 20
C. 12 or 36
D. 9.05 or 13. 22

Section 6 - Springs

55-Assume that one end of a helical spring is fixed with the concrete wall surface and the other end is tied up with a load of mass m. If the spring is expanded by x distance by applying F force at the end of the mass m, then how could you calculate the spring force F_s? [Consider Spring Constant]

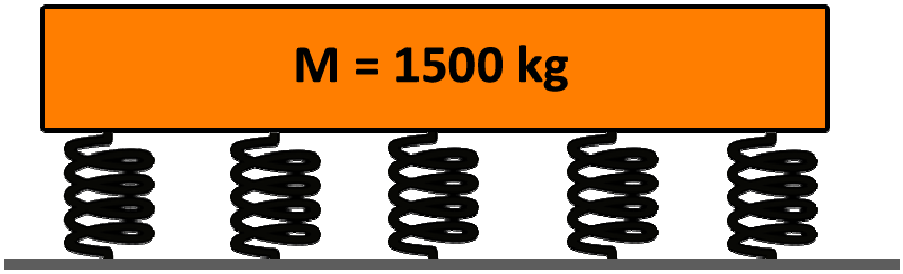


A. $F_s = -Fm/ 2x$
B. $F_s = - ½ Kx^2$
C. $F_s = - F/ 2m$
D. $F_s = -Kx$

56-The work done by a helical spring can be calculated as $W = ½ kx^2$, where **k** is the spring constant. On which condition does the value of this spring constant k depends?

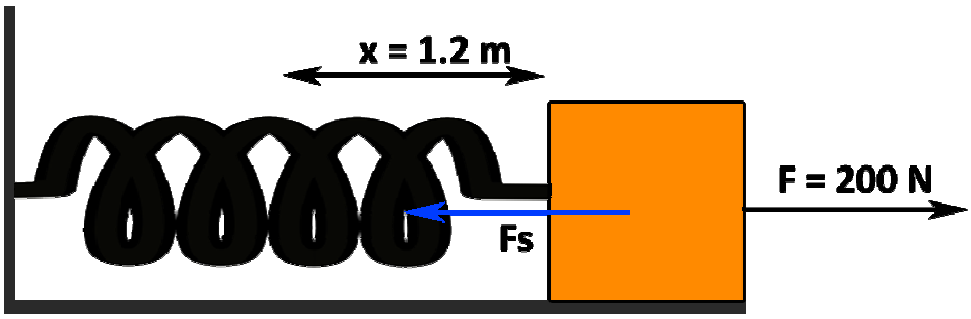
A. Length of the spring
B. Geometric structure of the spring
C. Elasticity of the spring
D. Direction of spring action

57-Assume, you have to lift an object of mass 1500 kg and you have only 4 shock absorbers of 0.75 m long. If all five shock absorbers use springs, then how strong do the springs need to be to lift this weight? [Consider Equal Mass Support with all these Shock Absorbers]



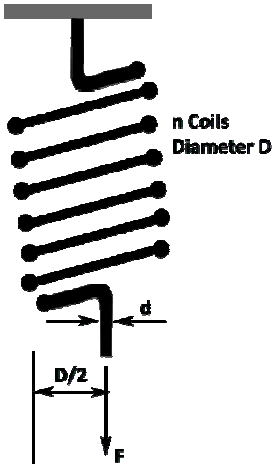
A. K = 1500 Nm^{-1}
B. K = 4440 Nm^{-1}
C. K = 2550 Nm^{-1}
D. K = 3920 Nm^{-1}

58-An object of mass 500 kg is fastened at one end of a spring, where other end is fixed. If this mass is pulled a bit with the force of 200 N with the displacement of 1.2 m, then which one of the value of its work done W? [Consider, spring constant is 2280 N/ m]



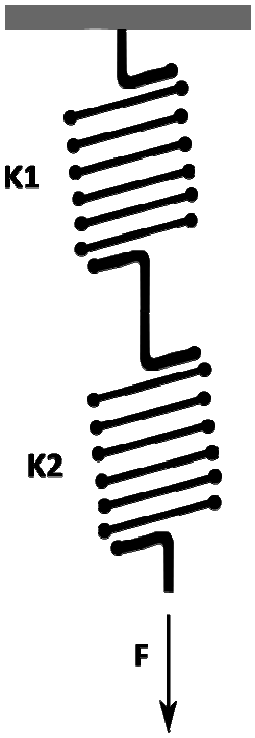
A. W = 1641.6 J
B. W = 3660.7 J
C. W = 2550.1 J
D. W = 1550.3 J

59-Assume that a helical spring is constructed with a wire of diameter d and length L. The helix formed with the wire has n coils, and its diameter is D. If it deflects down at height due to the load F, then how could you mathematically express the stiffness of this spring?



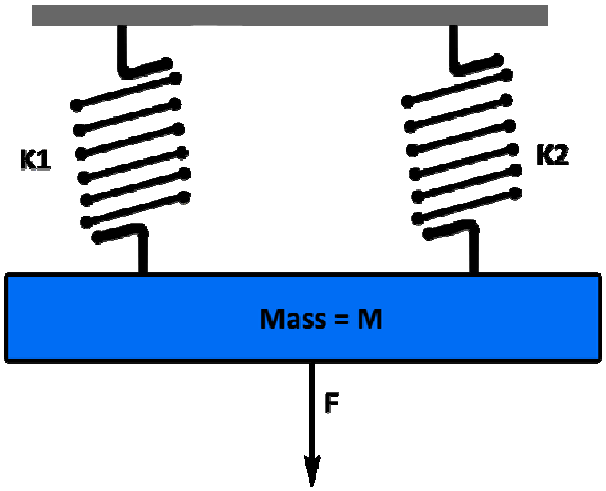
A. $F/y = 8d^4/nD^3$
B. $F = Gd/8n$
C. $F/y = Gd^4/8nD^3$
D. $F/y = 2Gd/8nD^2$

60-Two helical springs are in series connection where springs constants of both springs are K_1 and K_2 accordingly. Which one is the correct equation for resulting spring constant?



A. $K = ½ [(1/k_1) + (1/K_2)]$
B. $K = 1/[(1/k_1) + (1/K_2)]$
C. $K = 1/(k_1 + K_2)$
D. $K = 1/[(1/k_1) - (1/2K_2)]$

61-Two springs are connected in parallel to each other to hold an object of mass M. If the downward force becomes F, then what is the correct equation to calculate total resultant spring constant K?[Where, K_1 and K_2 are springs constants for both springs]



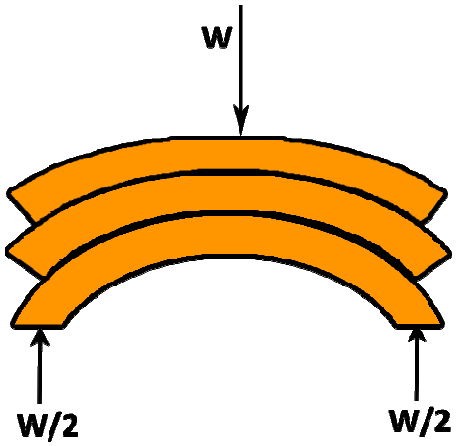
A. $K = K_1 + K_2$
B. $K = ½ (K_1 + K_2)$
C. $K = K_1 - K_2$
D. $K = 2K_1 + K_2$

62-A spring is subjected to compression with the load of 10 N and deflection of 0.24 m. If the spring constant of that spring becomes 1890 N/m, then calculate the elastic potential energy stored by the spring to hold this load.

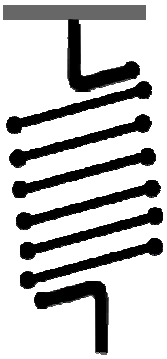
A. PE = 24.997 J
B. PE = 54.432 J
C. PE = 16.152 J
D. PE = 45.671 J

63-The figure illustrates a work action of a spring that is commonly used in automotives. What type of spring is in load here?

A. Helical Spring
B. Leaf Spring
C. Torsion Bar
D. Planet Spring



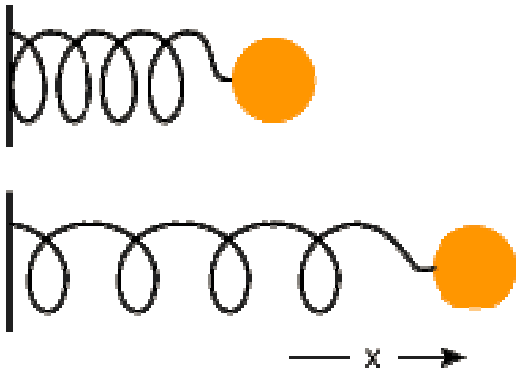
64-Assume that a spring is not in load meaning that it is in zero load condition. In that case, what would be your opinion about the potential energy (PE) of that spring?



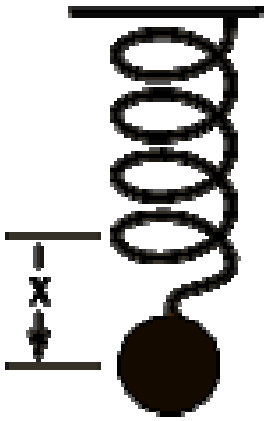
A. Steady PE position
B. Zero PE position
C. Negative PE position
D. Positive PE position

65-A spring is at no load position meaning that it is neither compressed nor stretched as shown in the figure. For that condition, what will be its elastic potential energy?

A. PE = 0
B. PE = ½
C. PE = 9.81x
D. PE = 1



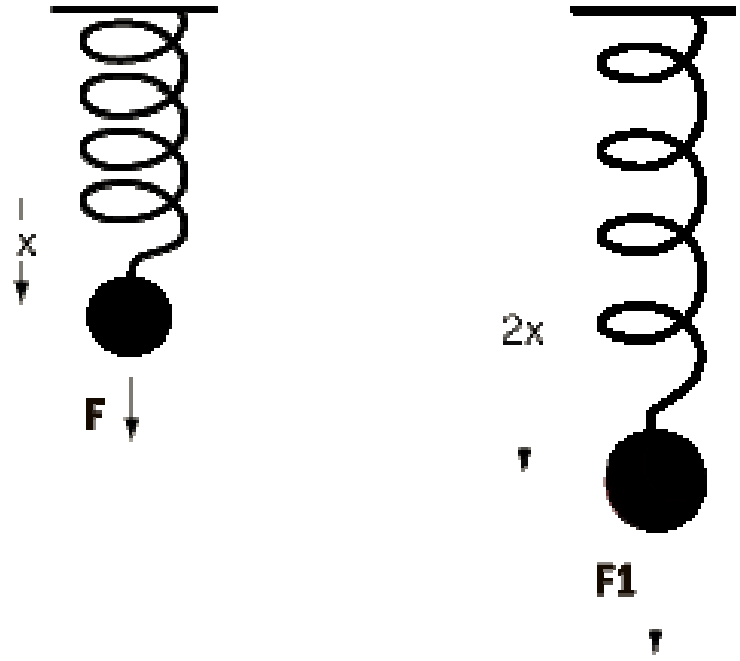
66-In the figure there is only one resonant frequency acting on the mass **m** on a spring. If the spring constant becomes k, then how could you calculate its vibrational frequency?



A. $\omega = 2Km$
B. $\omega = \sqrt{(k\pi/ m)}$
C. $\omega = \sqrt{(k/ m)}$
D. $\omega = ½ km^2$

67-In the figure, a spring is stretched up to x, where the force is F. If you stretch it up to 2x, then what will be the value of F_1?

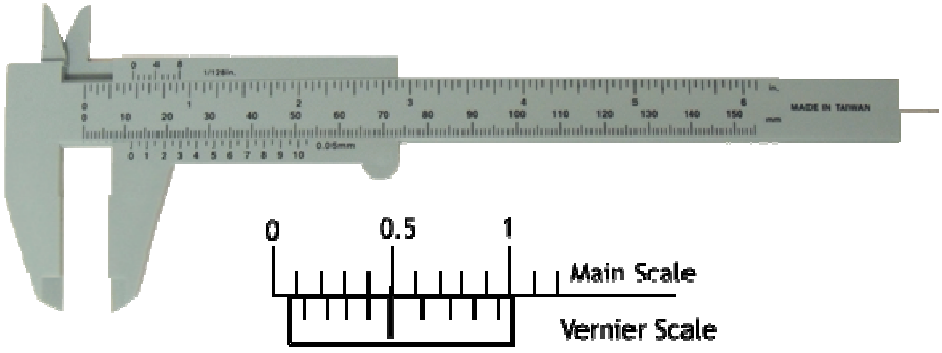
A. $F_1 = 2F$
B. $F_1 = ½ F$
C. $F_1 = 3/2 F$
D. $F_1 = ¼ F$



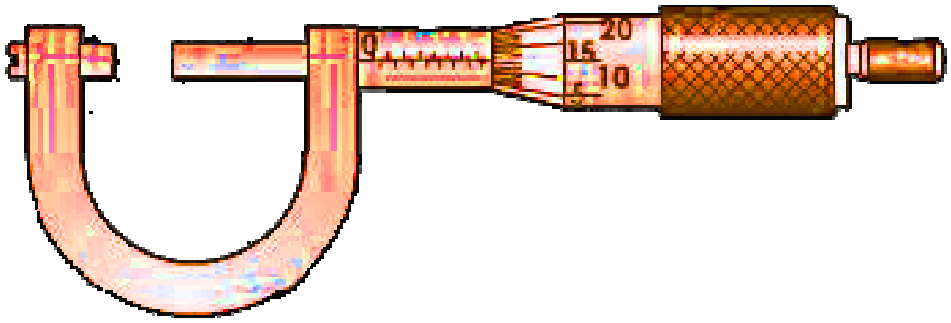
Section 7 - Tools

68-If have used a vernier caliper to measure the thickness of a MS plate. From the vernier, you have found 0.1cm in the main scale and 4 in the vernier scale. Now, how could you calculate the actual thickness of the plate? [Consider, vernier constant is 0.01 cm]

A. 0.14 cm
B. 4.1 cm
C. 1.4 cm
D. 0.41 cm

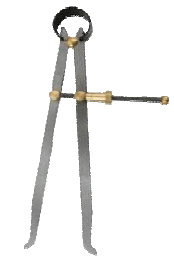


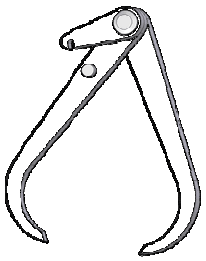
69-A person has used a screw gauge to measure the diameter of a wire. In the screw gauge, he has found 3 mm in the main scale and 25 in the drum. If the screw gauge constant becomes 0.01 mm, then which one will be the correct value for the wire diameter?



A. 3.25 mm
B. 3.025 mm
C. 3.0025 mm
D. 25.3 mm

70-Assume that you have a set of measuring tools as shown in the figure. If you have to measure the internal diameter of a 4" MS pipe, then which measuring tool would be the best selection for accurate reading?


Inside Caliper


Outside Caliper

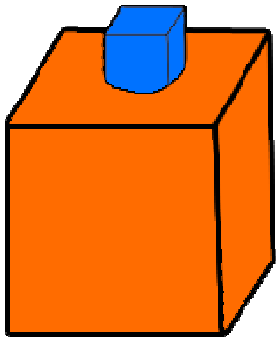

Measuring Tape


Vernier Caliper

A. Inside Caliper
B. Outside Caliper
C. Measuring tape
D. Vernier caliper

71-The top of a machine part is fitted with a bolt having box shaped head as shown in the figure below. To open this bolt, what type of hand tool should you prefer?

A. Plyer
B. Adjustable wrench
C. Socket Wrench
D. Pipe Wrench

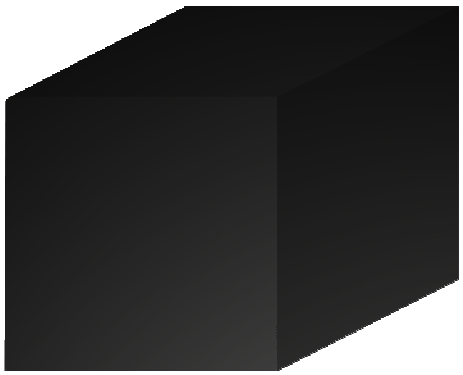


72-A person has purchased a MS flange of external diameter 4". He tried 3 times to measure the diameter with a measuring tape, but he failed to get 4". Which measuring tool should you prefer to measure its outer diameter perfectly?

A. Inside Caliper
B. Vernier caliper
C. Screw gauge
D. Outside caliper

73-The figure illustrates a metal piece that contains sharp edges. Now, you have to use a file to make it round. But, to do so you need to fix the job with a support so that it doesn't move. What type of supportive tool should you use to fix it up?

A. Colum Jigs
B. Two wrenches
C. Bench Vice
D. A metal box



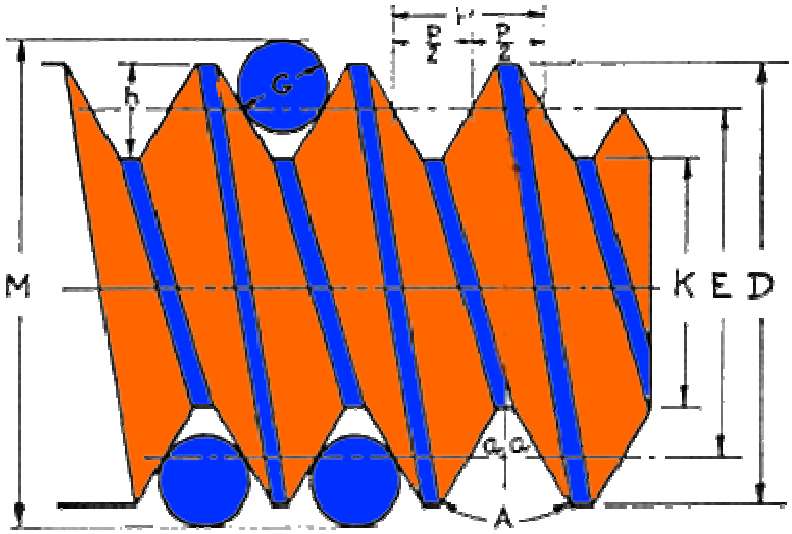
74-The figure illustrates a mechanical hand tool with double offset that is widely used in automotives or heavy industries. What is the name of this hand tool?

A. Open end wrench
B. Ring wrench
C. Adjustable wrench
D. L-Key

75-The figure illustrates a simple mechanical tool that has a vast filed in power plants. For which purpose this type of tools is used?

A. Bearing Pulling
B. Drilling
C. Adjusting an object
D. For Punching

76-Pitch diameter of a screw thread can be determined by the traditional 3 wire method as shown in the figure. If the depth of the screw thread becomes h, then how could you calculate the screw pitch diameter E?



A. E = D + 2h
B. E = D – 2K
C. E = D – M/2
D. E = D – h

Answers

1-D

Explanation:

The person has moved from point D straight forward to the North-West of the James St. road, and then he has turned left to the second intersection and walked towards South-East direction to reach the Trinity Hair Styling.

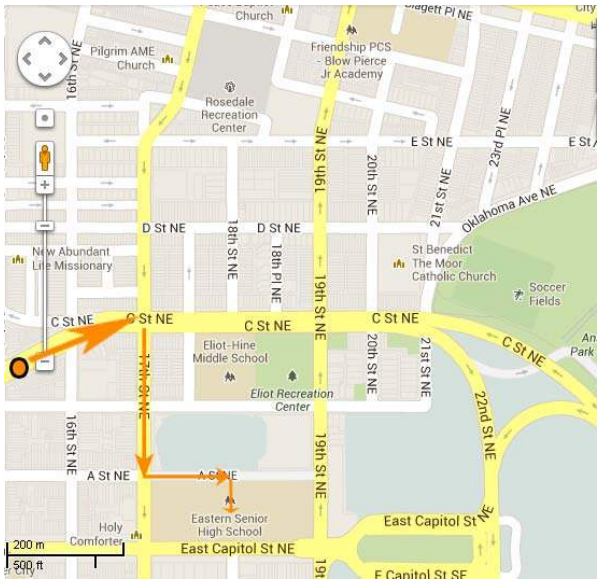
2-C

Explanation:

The person has started walking from the south-east corner of the Carlton St road. Then, at the first intersection he has turned right, walked a bit and then again turned left towards the north-east direction. According to this direction, he has reached to the Perfect Dental Teeth.

3-A

Explanation:



A boy has moved to USA from Germany to get his admission to the Eastern Senior High School. From the airport, he has reached to C St NE road. From the South-West corner, he has three options to move to the school. Here, the easiest way will be moving towards North-East, turning right at first intersection, at second intersection turning left.

4-A

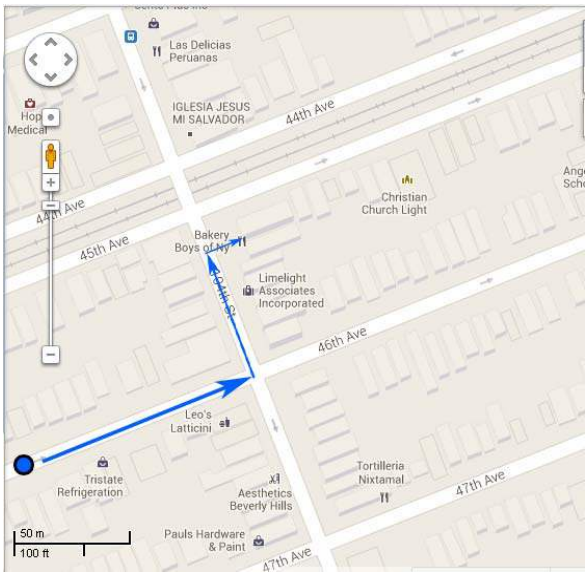
Explanation:

The easiest way to move to the KS Pharmacy from this existing position is to turn back, move towards right of the 1st intersection, and walk a bit from 2nd intersection. Then turning towards the left he can easily get the pharmacy.

5-B

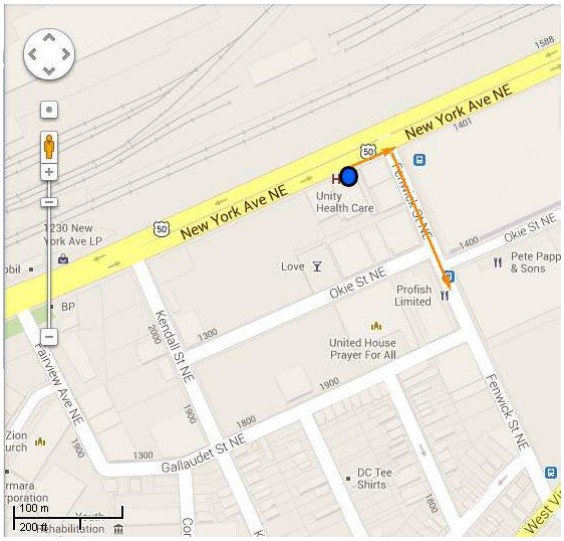
Explanation:

According to the direction, you have to startmoving from the south-west corner of the 46th Ave, then you have to move towards left at 1st intersection, after that walking a bit you have to turn right before 1st intersection. By moving through this direction, you will find the destination near by Bakery Boys of Ny.



6-A

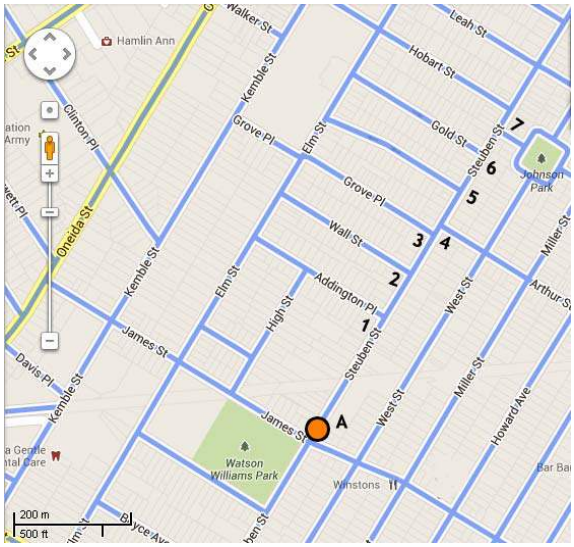
Explanation:



According to the notes, the patienthas moved towards the north-east, then turning right at 1st intersection he has started moving towards south-east and crossing the 1st and 2nd intersection he has stopped running.

7-A

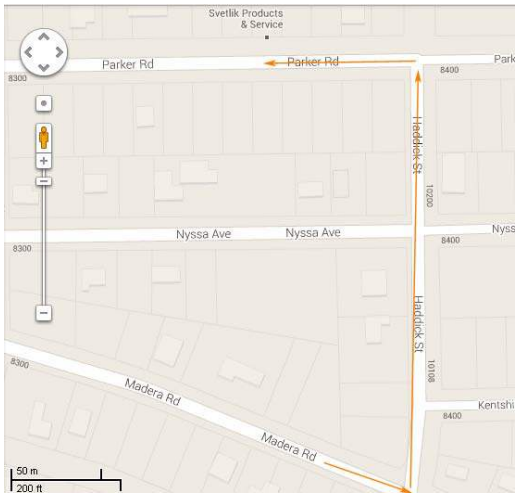
Explanation:



If the current location of the tourist becomes A, then he has to count 7 sub road intersections to reach the Johnson Park as shown in the map below.

8-A

Explanation:



From the map direction it becomes clear that from Madera Rd you have to move to the left towards north, and then after crossing 3 intersections you have to you have to turn left at the 4th intersection to reach Svetlik Products & Service.

9-B

Explanation:

As the driver is moving towards the east of the Way St road to reach to the OK Korral Montessori School, he needs to turn left at the 2nd intersection, move straight, and then turn right at the 2nd intersection.

10-D

Explanation:

Here, given that

Crowbar length = 1.2 m

Fulcrum and load distance = 0.4 m

L = 850 N E = 450 N

So,

VR = 1.2/ 0.4 = **3**

MA = L/ E = 850 N/ 450 N = **1.88**

E = MA/ VR = 1.88/ 3 = **62.66%**

11-A

Explanation:

Here,

E = 225 N, X = 0.8 m, l = 2.8 m, E = 0.75, and L =?

From the expression of Velocity Ratio we know that

VR = l/ x = 2.8/ 0.8 = 3.5

Again, from the expression of Efficiency we get that

E = MA/ VR

0.75 = MA/ 3.5

MA = 3 x 0.75 = 2.626

So, putting the value in the expression of mechanical advantage we get that

MA = L/ E

2.625 = L/ 225

L = 590.625 N

12-A

Explanation:

From the working principle of a lever we get that the work done on both sides of a lever is same. It can be expressed as:

Work output = Work input

$F_2 \times S_2 = F_1 \times S_1$. [Here, W = FS]

Where,

F_2 = Effort

S_2 =Distance between effort and fulcrum

F_1= Load

S_1 = Distance between load and fulcrum

13-A

Explanation:

From the working principle of lever we know that when work is done, those lengths are proportional to the distances of both ends. This can be expressed mathematically as:

$L_2/ L_1 = D_2/ D_1$,

Where,

L_2 = Length between fulcrum and effort

L_1 = Length between fulcrum and load

D_2 = Distance between fulcrum point to effort end of the lever

D_1 = Distance between fulcrum and load point of the lever

14-C

Explanation:

From the working principle of lever we know that when work is done, those lengths are proportional to the distances of both ends. So, the expression becomes

$X/ 15 = 25/ 85$

$X = (25 \times 15)/ 85$

X = **4.41 inches**

15-D

Explanation:

Given that

$m_1 = 50$ kg $\quad\quad$ $m_2 = 80$ kg

$S_1 = 10$ m $\quad\quad$ $S_2 = ?$

We know that

$F_1 x S_1 = F_2 x S_2$

So,

$m_1 x g x S_1 = m_2 x g x S_2$

$50 \times 10 = 80 \times S_2$

$S_2 = 6.25$ m

16-C

Explanation:

Given that

$F_1 = 650$ lb

$S_1 = 3$ ft

$F_2 = ?$

$S_2 = (10 - 3) = 7$ ft

We know that

$F_1 x S_1 = F_2 x S_2$

$650 \times 3 = F_2 \times 7$

$F_2 =$ **278.51 lb**

17-B

Explanation:

Given that

F_1 =250 lb

F_2= ?

S_1 = 3 ft

S = 9 ft

Here, the length is increased 9 ft more. So, total length becomes 9+3 = 12 ft.

We know,

$F_1 xS_1 = F_2 xS_2$

250 x 3 = F_2 x9

F_2**= 83.33 lb**

So, you need **83.33**lb effort to lift that load with the lever of total 12 ft long, where the fulcrum is placed at a distance of 3 ft from the load.

18-C

Explanation:

This circuit connection can be described from the Kirchhoff's current law. All three resistors are in parallel connection.

Given that,

R_1 = 75Ω, R_2 = 115 Ω, and R_3 = 275Ω

Here,

V = V_1 = V_2 = V_3 = 120 volts

So, the current across each resistor can be calculated as

I_1 = V/ R_1 = 120/ 75 = **1.6 amps**

$I_2 = V/ R_2 = 120/ 115 =$ **1.04 amps**

$I_3 = V/ R_3 = 120/ 275 =$ **0.44 amps**

19-A

Explanation:

Here give that four source voltages are 12 v, 18 v, 55 v, and 28 v. To solve this circuit, we have to apply Kirchhoff'svoltage law. Starting from point A in the clock wise direction we get that

$V + 12 – 18 – 55 + 28 = 0$

$V – 33 = 0$

V = 33 volts

20-D

Explanation:

By applying Kirchhoff's Current Law at node A we get that

$-I_1 + 25 + I_2 – I_3 – 7 = 0$

$-I_1 + I_2 – I_3 = -18$

$I_1 - I_2 + I_3 = 18$ …….. (i)

Again,by applying I = V/ R to calculate the current in each section

$I_1 = V/ 3$, $I_2 = V/ 5$, $I_3 = V/ 8$

So, from equation (i) we get that

$V/ 3 – V/ 5 + V/8 = 18$

V = 69.76 volts

21-B

Explanation:

Here,

V = 30 V, R_1 = 75Ω, R_2 = 275 Ω, R_3 = 110 Ω

By applying Kirchhoff's voltage law, we get that

$30 – V_1 – V_2 – V_3 = 0$

$V_1 + V_2 + V_3 = 30$

$I (75 + 275 + 110) = 30$

I = **0.065 A**

22-C

Explanation:

Here,

R_1 = 45 Ω, R_2 = 115 Ω, R_3 = 95 Ω and V = 110 volts

By applying Kirchhoff's voltage law,

$110 – V_1 – V_2 – V_3 = 0$

$V_1 + V_2 + V_3 = 110$

$I (45 + 115 + 95) = 110$

I = 0.43 amps

We know that Power dissipated

P = I V

P = 0.43 x 110 = **47.3 watts.**

23-A

Explanation:

Voltage across any resistor can be determined by a voltmeter. To determine this voltage, you should remember that voltmeters always get connected to the parallel of resistors in the circuit.

24-B

Explanation:

In case of a series connection, equivalent resistance can be calculated as

$R = R_1 + R_2 + R_3 + R_4 + R_5$

$R = 12 + 17 + 8 + 22 + 24$

$R = 94\ \Omega$

25-C

Explanation:

In any simple Wye connection, resulting resistances across AB can be calculated as of series connections

$Ra_b = R_a + R_b$

$R_{ab} = (12 + 15)\Omega$

$R_{ab} = 27\ \Omega$

26-B

Explanation:

Here, in this arrangement two wheels of diameter D_1 and D_2 are connected with a pulley belt. When it is subjected to rotation, rpm on both wheels become N_1 and N_2.

The relationship between liner and angular velocity

$V = \pi DN$

Applying this equation on both wheels we get that

$N_1 / N_2 = D_2 / D_1$.

27-D

Explanation:

In this arrangement, two active forces are F_1 and F_2. We know that mechanical power is the product of velocity and force P = FV watts. It can be simplified by the equation,

$P = V (F_1 – F_2)$

$P = \pi DN (F_1 – F_2)$ [Where, $V = \pi DN$]

Here,

V = velocity

D = Diameter of the pulley

N = revolution of the pulley

28-A

Explanation:

The figure illustrates that the large force being held to the small force being exerted. Here, these two forces are denoted as F_1 and F_2 accordingly. However, when the belt runs, it loses some energy due to friction. If this frictional coefficient is represented with μ, then the relation between these two forces F_1 and F_2 can be established as like$F_1 / F_2 = e^{\mu\theta}$.

29-D

Explanation:

Given that

F_1 = 480 N, F_2 = 220N, θ = 180° = π radian

We know that

$F_1 / F_2 = e^{\mu\theta}$

$480/ 220 = e^{\mu\theta}$

$\ln 2.18 = \mu\theta$

$\mu = \ln 2.18/ \pi =$ **0.248**

30-B

Explanation:

Here,

N = 1200 rpm, D = 0.32 m, $F_1 = F_2$ =140 N [When Stationary]

θ = 135° = (π x 135)/180 = 2.3562 radians

From the velocity equation we get that

$V = \pi DN$

$V = 3.1416 \times 0.32 \times (1200/ 60) = 20.10\ ms^{-1}$

At stationary position,

$F_1 + F_2 = 280$ N. So, $F_2 = 280 - F_1$

Again we know that

$F_1 / F_2 = e^{\mu\theta}$

$F_1 = e^{(0.32 \times 2.3562)} \times F_2$

$F_1 = 1.93 (280 - F_1)$

$F_1 =$ **184.43 N**

So, F_2 = 280 - 184.43 = **95.57 N**

Again from the equation of mechanical power we get that

$P = V (F_1 – F_2)$

$P = 20.106 (184.43 – 95.57) =$ **1786.619 W**

31-D

Explanation:

Here, a V-belt of angle 2β is working. From this figure, the derivative equation of force can be written as

$dF = \mu R/ 2 \text{ Sin } \beta$

Here, two forces are in action. So, the friction force will be double. So, the force derivative equation can be written as

$dF = \mu R/ \text{ Sin } \beta$

By integrating this equation from the limit of F_1 to F_2, we get that $F_1/ F_2 = e^{(\mu\theta/ \text{ Sin } \beta)}$.

32-C

Explanation:

From the power transmission equation of a belt can be written as

$P = \pi ND (F_1 – F_2)$

By, subtracting F_c from each term we get that

$P = \pi ND [(F_1 – F_c) – (F_2 – F_c)]$

Again we know that

$F_2 – F_c = (F_1 – F_c)/ e^{\mu\theta}$

So, we get

$P = \pi ND (F_1 – F_c) (1 - e^{-\mu\theta})$ $\quad$ **$P = V (F_1 – F_c) (1 - e^{-\mu\theta})$**

33-D

Explanation:

Here,

$\rho = 1150\ kgm^{-3}$, $A = 0.00045\ m^2$, $F_1 = 580\ N$, $V = 8\ m/s$, $\mu = 0.28$

As the centrifugal force is considered, then the Force equation becomes

$$F_c = \rho A V^2$$

$$F_c = 1150 \times 0.00045 \times (8)^2$$

$$F_c = 33.12\ N$$

Again $\theta = \pi \times 145/ 180 = 2.53$ radian

So, the power equation becomes

$$P = V (F_1 - F_c) (1 - e^{-\mu\theta})$$

$$P = 8 \times (580 - 33.12) [1 - e^{-(0.28 \times 2.53)}]$$

$P = 2220.632$ watt

34-B

Explanation:

Here,

$\rho = 850\ kgm^{-3}$, $A = 0.00038\ m^2$, $F_1 = 480\ N$, $\theta = 140^o$, $\mu = 0.28$

The velocity at which maximum power occurs can be calculated as

$$V = [F_1/ (3\rho A)]^{1/2}$$

$$V = [480/ (3 \times 850 \times 0.00038)]^{1/2}$$

$V = 22.256\ ms^{-1}$

35-A

Explanation:

Here,

$m_1 = 18$ kg, $m_2 = 10$ kg, T = ?

By applying Newton's second law, F = ma we get that

$18g - T = 18a$

Again for the second mass we get

$T - 10g = 10a$

By solving these two equations and putting the value of T from second equation to 1st equation, we get

$18g - 10a - 10g = 18a$

$a = 8g/ 28 = 2.80$

By putting the value of a in the second equation we get that

$T = 10 \times 2.8 + 10 \times 9.81$

T = 126.1 N

36-A

Explanation:

We know that Mechanical Advantage,

MA = Load/ Effort

MA = 1300/ 350

MA = 3.71

37-B

Explanation:

The figure illustrates a simple pulley arrangement of 4 sections. As this arrangement contains 4 sections, its velocity ratio will be 4.

38-A

Explanation:

Here, Reaction Force

$R = W + F$

$R = mg + mg$

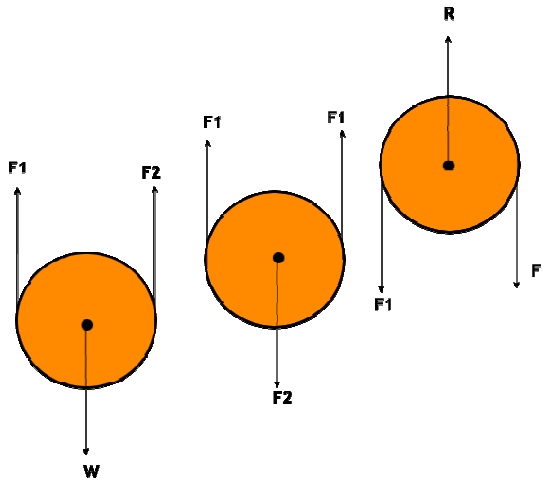
$R = 2mg$

$R = 2 \times 25 \times 9.81 =$ **490.5 N**

39-B

Explanation:

If we separate the full arrangement, it will look like the below



From here, we get that

$F = F_1 = mg/4$

$F = 15 \times 9.81/4 =$ **36.78 N**

40-B

Explanation:

Here, two masses are acting in a pulley system, where mass M is working under frictional force and perpendicular normal force N. Then, the equation of the frictional force can be represented as

$F_f = \mu N$

Here, μ = Frictional co-efficient and N = Normal force acting perpendicular to the frictional force.

41-A

Explanation:

According to the definition of Gear box ratio,

Gear box ratio = Input speed/ Output speed

GR = $\mathbf{N_1 / N_2}$

Here,

N_1 = Input Speed and N_2 = Output Speed

42-D

Explanation:

Here, given that Power Input P_1 = 30 KW, Efficiency η = 70% = 0.7

From the definition of Mechanical Efficiency we get that

η = Power output/ Power Input

$0.7 = P_2 / 30$

$\mathbf{P_2 = 21\ KW}$

So, the Output Power is 21 KW.

43-C

Explanation:

From the definition of gear ratio, we know that

GR = Input Speed/ Output Speed

Here, A gear supplies the input speed and C gear provides the output speed

So, **GR = N_A/ N_c**

44-A

Explanation:

Here,

t_A = 40, t_c = 120, N_A = 1200 rpm

We know that

GR = N_A/ N_C = t_c/ t_A = 120/ 40 = **3**

Again,

N_A/ N_C = 3

N_c = 1200/ 3 = **400 rpm**

45-A

Explanation:

In this gear system, B and C gears are revolving relative to the gear A that is very similar to the planet where earth and other planets revolve relative to the sun. Here, the gear S can be defined as the Sun Gear. Other gears B and C are known as the planetary gear.

46-D

Explanation:

The gear ratio of a compound gear chain can be calculated as

GR = Product of driven teeth/ product of driving teeth

GR = (80 x 80 x 80)/ (20 x 40 x 10)

GR = 64

47-A

Explanation:

Here, A, C, and E are driving gears. If the A gear rotates clockwise, B and C will rotate anticlockwise. Then, D and E will rotate clockwise. So, the output gear F will rotate anticlockwise.

48-B

Explanation:

Here,

N_1 = 900 rpm, N_2 = 150 rpm, P_{in} = 20 KW

So, Power Input

$P_{in} = 2\pi N_1 T_1 / 60$

$T_1 = (20 \times 10^3 \times 60)/ (2 \times 3.14 \times 900)$

T_1 = 212.31 N-m

49-D

Explanation:

If a worm gear contains 40 teeth, its gear ratio becomes 40:1. That means it can reduce the speed 40 times the initial speed. So, it is better to use a worm gear, where it requires reducing the speed by a considerable amount.

50-A

Explanation:

Herringbone gears are also known as the double helical gear. This type of gear poses side by side combination of two helical gears. Its teeth arrangement looks like the letter V. For smooth turbine and marine operations, this type of gears is used to reduce axial thrusts.

51-A

Explanation:

From the working principle of a simple spur gear it becomes clear that this type of gear can only be meshed properly if they are fitted to the parallel axles.

52-A

Explanation:

From the design structure and working principle of a herringbone gear we know that for proper mesh up this type of gears must have same pressure angle and pitch.

53-A

Explanation:

From the graphics, it becomes clear that the helix angle is the angle of teeth alignment as compared to the axis. Here, the helix is positioned along the teeth. So, the angle formed with the axis will be its helix angle.

54-B

Explanation:

Pressure angle can be defined as the tooth drive action angle. Actually, it is the angle of line of force between meshing teeth and the tangent to the pitch circle at the point of mesh. Typically, its value is 14.5 or 20.

55-D

Explanation:

Here, the object of mass m is pulled with the force F meaning that the spring is pulled with the force F. One of the important characteristics of spring is to expert a force in opposition of the applied force. So, it will exert a force F_s that is opposite of the applied force. Now, considering the spring constant K, the final equation of this exerted force can be written as the

$$F_s = -Kx$$

Here,

F_s = Spring exerted force

K = Spring Constant

x = Displacement

The negative sign means that the displacement of that object is in the opposite direction of the spring exerted force.

56-A, B, C

Explanation:

From the expression of spring constant we know that

$$k = F/ x$$

From this equation it becomes clear that the length of the spring will bring a significant effect to the value of spring constant. However, it will also change with the change of the geometric structure of the spring and the elasticity of the spring.

57-D

Explanation:

Here, five shock absorbers have to carry the load of 1500 kg. If they equally hold the load, then each spring has to carry 300 kg load.

So,

F = mg = 300 x 9.81 = 2940 N

Again,

k = F/ x = 2940/ 0.75 = **3920 N/ m**

58-A

Explanation:

Here,

m = 500 kg, F = 200 N, k = 2280 N/ m, x = 1.2

We know that

$W = ½ kx^2$

W = ½ 2280 x (1.2) = **1641.6 J**

59-C

Explanation:

From the torque equation T = FD/ 2 the equation of spring stiffness can be calculated as the $F/ y = Gd^4/ 8nD^3$, where

F = Applied Force
y = Spring deflection
n = number of coils
D = Diameter of the helix
D = Spring wire diameter

60-B

Explanation:

Here,

$F = F_1 = F_2$

$$\Delta_T = \Delta_1 + \Delta_2 = F_1/ K_1 + F_2/ K_2 = F_T/ K_1 + F_T/ K_2$$

Now, by putting the value in the equation $K = F_T/ \Delta_T$ we get that

$$\mathbf{K = 1/ [(1/ k_1) + (1/ K_2)]}$$

Where, K_1 = Spring constant for 1st spring, and K_2 = Spring constant for 2nd spring

61-A

Explanation:
Assume, the deflection is y.

We know that

$$F = F_1 + F_2 = K_1y + K_2y$$

So,

$K = F/ y = K_1y + K_2y/ y = \mathbf{K_1 + K_2}$

Where, K_1 and K_2 are springs constants of two springs.

62-B

Explanation:

Here,

F = 10 N, x = 0.24 m, K = 1890 N/m

So, potential energy stored in the spring can be calculated from the equation

$PE = ½ Kx^2$

$PE = ½ \times 1890 \times (0.24)^2$

$PE =$ **54.432 J**

63-B

Explanation:

The figure illustrates a commonly used spring that has vast fields in automotives and heavy industries. It is known as the leaf spring. Its work action is very similar to leaf. It uses deformed bars staged in a series to hold the load on stages.

64-B

Explanation:

If the condition arises like that the spring is not subjected to any load, then it can be said that this spring is neither stretched nor compressed. You can also say it the equilibrium position of the spring. For such a condition, the spring is said to be in zero PE position.

65-A

Explanation:

From the definition of elastic potential energy of a spring we know that

$PE = ½ Kx^2$, where x = displacement

Here, for the static position, the value of x equals to zero. That means x = 0

So, we get the final equation

$PE = ½ k (0)^2 =$ **0**

66-C

Explanation:

There is only one resonant frequency acting on the mass m on a spring. By resolving Newton's Second law of motion, the final equation of vibrational frequency becomes

$$\omega = \sqrt{(k/ m)}$$

Here, k = spring constant, and m = mass of the object

67-A

Explanation:

From the force equation of a spring, we get that

F = -kx, where k = spring constant

So, when the x becomes 2x, the value of F becomes 2F as the value of k is constant.

Then, we can write the equation for the second case as like

$$\mathbf{F_1 = 2F}$$

68-A

Explanation:

The main scale value is 0.1 cm, and vernier scale value is 4. The value in the vernier scale represents that the 4^{th} value matches well in both vernier and main scale.

Now the final thickness of the MS plate

t = 0.1 cm + 4 x 0.01 cm

t = 0.14 cm

So, you can easily measure and calculate the thickness of any object with a vernier caliper.

69-A

Explanation:

Here, the main scale value is 3 mm, and the drum value is 25. So, the diameter of the wire

D = 3 mm + 25 x 0.01 mm

D= 3.25 mm

By applying this method, you can easily measure the diameter of a wire.

70-A

Explanation:

Inside caliper would be the best selection to measure the internal diameter of a pipe. It is especially designed to measure internal diameters. You just need to set the caliper inside the pipe, and the lock it and then, place it to a scale to get the reading of diameter.

71-C

Explanation:

To open this type of bolts from any machine part, it is better to use socket wrench. The socket wrench has the box shaped sockets to hold and fit with the bolt head properly. However, other tools like plyer, adjustable wrench, and pipe wrench may damage the bolt head of the machine part. So, to ensure human and materials safety, a socket wrench is highly preferable.

72-D

Explanation:

An outside caliper is the most suitable measuring tool to measure the outside diameter of any circular object. You just need to put the outside caliper perfectly to the object, and lock the caliper and bring it to match with a scale reading. You will get your desired value of the diameter. This is the simplest and most reliable way to measure outside diameter.

73-C

Explanation:

A bench vice would be the perfect choice to fix the job. This type of vices provide adjustable key that will give you freedom to tighten and loosen up the job according to requirements. You can easily fit the job to a bench vice and do you filing to make its edges round. You can also use this type of vices for circular or cylindrical objects to perform any kind of tasks like filing or drilling.

74-B

Explanation:

This is a widely used mechanical hand tool. It is especially used in automobile or heavy industries. This hand tool with double offset is commonly known as the Ring Wrench. It is named like that due to its ring type ends.

75-A

Explanation:

The figure illustrates a simple mechanical tool this basically used to pull out a bearing from its fit up. Practically, it is really tough to pull out bearing safely in an empty hand or with other tools. But, it can be easily done with this tool. You just need to set up the puller in the bearing, and when you rotate the threaded screw, the bearing will automatically come out.

76-D

Explanation:

Pitch diameter of an object can be defined as the diameter, where the space between threads becomes equal to the tread thickness. Here, given that the major diameter is D, and the depth of the thread is h. So, the formula can be written as

E = Major Diameter - Depth of the thread

E = D - h

Practically, it is really tough to measure the pith of thread or pitch diameter. You could make it easier by using this 3 wire method. But, for this you need to select perfect wire from the set that matches well with the screw thread.