

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 6B

1

Three people are trying to move a skip. Two of the people are pushing horizontally with forces of magnitude 120N and 150N and one person is pulling with a horizontal force of magnitude X N. The frictional force resisting motion is 385N. Given that the skip does not move, find the value of X .

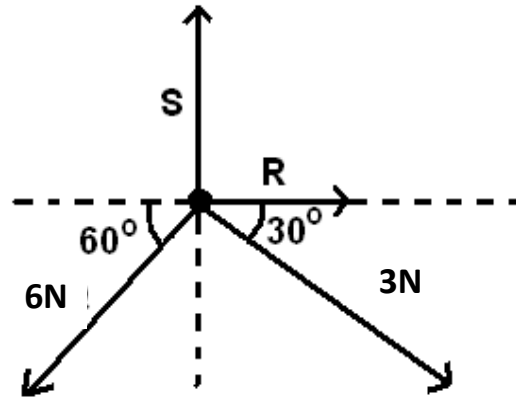
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2

A particle at the origin is in equilibrium under the action of forces shown. Find the forces R and S



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3

A woman travels in a lift. The mass of the woman is 50 kg and the mass of the lift is 950 kg. The lift is being raised vertically by a vertical cable which is attached to the top of the lift. The lift is moving upwards and has constant deceleration of 2 m s^{-2} . By modelling the cable as being light and inextensible, find

- (a) the tension in the cable,
- (b) the magnitude of the force exerted on the woman by the floor of the lift.

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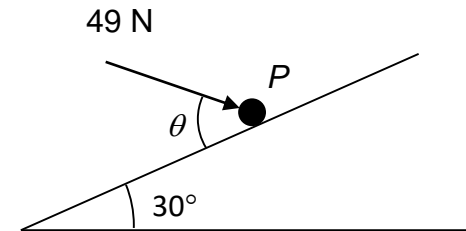
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A particle P of mass 6 kg lies on the surface of a smooth plane. The plane is inclined at an angle of 30° to the horizontal. The particle is held in equilibrium by a force of magnitude 49 N, acting at an angle θ to the plane, as shown in Figure 1. The force acts in a vertical plane through a line of greatest slope of the plane.

(a) Show that $\cos \theta = 0.6$.

(b) Find the normal reaction between P and the plane.



The direction of the force of magnitude 49 N is now changed. It is now applied horizontally to P so that P moves up the plane. The force again acts in a vertical plane through a line of greatest slope of the plane.

(c) Find the initial acceleration of P .

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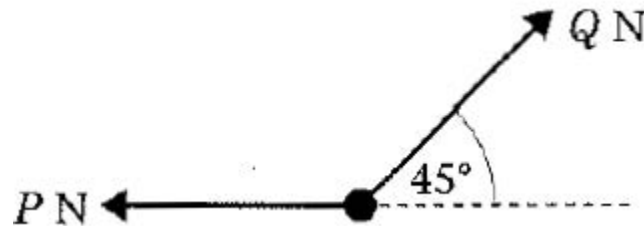
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A particle of mass 3kg is held in equilibrium by two light inextensible strings. One string is horizontal. The other string is inclined at 45° to the horizontal, as shown in the figure. The tension in the horizontal string is P N and the tension in the other string is Q N. Find

- (a) the value of Q
- (b) The value of P



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An astronaut weighs 735 N on earth and 120 N on the moon. Work out the value of acceleration due to the gravity on the moon.

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(a) Find the positive value of x such that

$$\log_x 64 = 2.$$

(b) Solve for x

$$\log_2 (11 - 6x) = 2 \log_2 (x - 1) + 3.$$

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The masses, x kg, of 50 bags of flour were measured and the results were summarised as follows.

$$n = 50, \quad \Sigma(x - 1.5) = 1.4, \quad \Sigma(x - 1.5)^2 = 0.05$$

Calculate the mean and standard deviation of the masses of these bags of flour.

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A1 DOUBLES ASSIGNMENT 6B

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A car is moving along a horizontal level road. The car's engine provides a constant driving force. The motion of the car is opposed by a constant resistance.

- (a) Modelling the car as a particle, draw a force diagram to show the forces acting on the car.
- (b) Given that the resultant force acting on the car is 4200N in the direction of motion, and that the magnitude of the driving force is eight times the magnitude of the resistance force, calculate the magnitude of the resistance.

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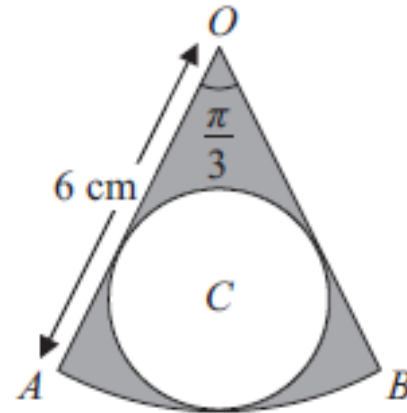
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The shape shown in Figure 1 is a pattern for a pendant. It consists of a sector OAB of a circle centre O , of radius 6 cm, and angle $AOB = \frac{\pi}{3}$. The circle C , inside the sector, touches the two straight edges, OA and OB , and the arc AB as shown.

Find

- (a) the area of the sector OAB ,
- (b) the radius of the circle C .



The region outside the circle C and inside the sector OAB is shown shaded in Figure 1.

- (c) Find the area of the shaded region.

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The events A and B are independent, $P(A) = 0.4$, $P(A \cap B) = 0.12$ and $P(A' \cap B') = 0.42$.

Using a Venn diagram and showing all your working, find:

(a) $P(B)$

(b) $P(A \cup B)$

(c) $P(A' \cap B)$

(d) $P(A|B')$

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Given that $y = 3x^2$,

(a) show that $\log_3 y = 1 + 2 \log_3 x$.

(b) Hence, or otherwise, solve the equation

$$1 + 2 \log_3 x = \log_3 (28x - 9).$$

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A car is travelling along a straight horizontal road. The car takes 120 s to travel between two sets of traffic lights which are 2145 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 30 s until its speed is 22 m s^{-1} . The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights.

- (a) Sketch a speed-time graph for the motion of the car between the two sets of traffic lights.
- (b) Find the value of T .

A motorcycle leaves the first set of traffic lights 10 s after the car has left the first set of traffic lights. The motorcycle moves from rest with constant acceleration, $a \text{ m s}^{-2}$, and passes the car at the point A which is 990 m from the first set of traffic lights. When the motorcycle passes the car, the car is moving with speed 22 m s^{-1} .

- (c) Find the time it takes for the motorcycle to move from the first set of traffic lights to the point A.
- (d) Find the value of a .

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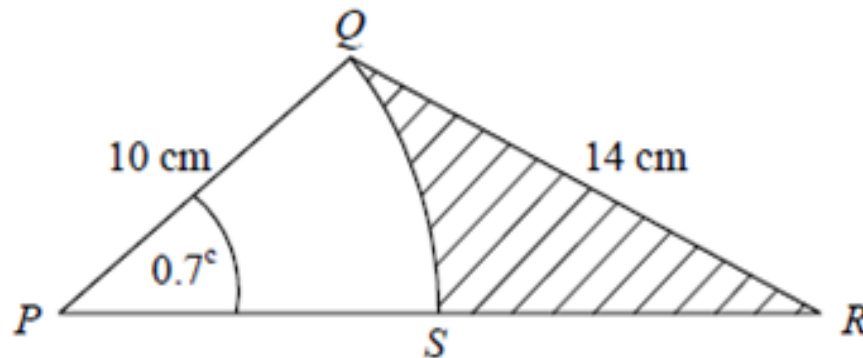
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The diagram shows triangle PQR in which $PQ = 10$ cm, $QR = 14$ cm and $\angle QPR = 0.7$ radians.

(a) Find the size of $\angle PRQ$ in radians to 2 decimal places.

The point S lies on PR such that $PS = 10$ cm. The shaded region is bounded by the straight lines QR and RS and the arc QS of a circle, centre P .

(b) Find the area of the shaded region to 1 decimal place.



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a) Which of the following are true

- i) 10 decametres = 100 metres
- ii) 1 decametre = 10 metres
- iii) 100 decametres = 1 kilometre
- iv) the abbreviation for decametre is dm

b) Which of the following are true

- i) in the large data set, Visibility is measured in decametres
- ii) Visibility is defined as the greatest distance at which an object can be seen and recognized in daylight
- iii) Visibility is also defined as the greatest distance at which an object can be seen and recognized at night if the general illumination were raised to daylight level.
- iv) Visibility is measured using visimeter
- v) Visibility is measured vertically

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(c) The table shows the Daily mean Visibility in Heathrow, Hurn and Leeming (but not necessarily in that order) for the first week in May 1987. Use statistical techniques to try and identify which is which. What assumptions have you made? How reliable is your answer?

	A	B	C
1-May-87	800	1300	2300
2-May-87	2300	2500	3600
3-May-87	3000	2100	3100
4-May-87	2500	2800	4600
5-May-87	1600	2400	2900
6-May-87	800	1100	1500
7-May-87	1800	1900	1700

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1 - Answers

X=115N

TAP TO RETURN

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A1 DOUBLES ASSIGNMENT 6B

2 – Answers

$$R = 0.402N, S = 6.70N$$

TAP TO RETURN

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3 - Answers

$$T = 7800 \text{ N}$$

$$R = 390 \text{ N}$$

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A1 DOUBLES ASSIGNMENT 6B

4 - Answers

$$R = 90\text{N}, a = 2.2\text{ms}^{-2}$$

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5 - Answers

(a) $R(\uparrow)$

$$Q \sin 45 - 3g = 0$$

$$\begin{aligned}\therefore Q &= \frac{3g}{\sin 45} \\ &= 3\sqrt{2}g \\ &= 42 \text{ (2 s.f.)}\end{aligned}$$

(b) $R(\rightarrow)$

$$Q \cos 45 - p = 0$$

$$\begin{aligned}\therefore P &= 3\sqrt{2}g \cos 45^\circ \\ &= 3g \\ &= 29 \text{ (2 s.f.)}\end{aligned}$$

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6 - Answers

1.6 m s⁻²

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7 - Answers

(a) $x=8$ (b) $x = \frac{3}{2}$

[ignore

– $\frac{1}{4}$ as this does not work when substituted back into original question]

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8 - Answers

$$\bar{x} = 1.528, \sigma = 0.015 \text{ (3sf)}$$

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9 - Answers

(b) 600N

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10 - Answers

(a) 6π ; (b) $r=2$; (c) 2π

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11 - Answers

(a) 0.3 (b) 0.58

(c) 0.18

(d) 0.4

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12 - Answers

$$x = \frac{1}{3} \text{ or } 9$$

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13 - Answers

(b) 75; (c) 50; (d) 0.79

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14 - Answers

(a) 0.48

(b) 29.7 cm²

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15 - Answers

a) all true

b) i) true, ii) true, iii) true iv) False – it's a visio**o**meter v) False – it's
measured horizontally

c) A = Hurn, B = Heathrow, C = Leeming

Not enough data to be reliable. Visibility isn't necessarily better further South.

TAP TO RETURN