9) A student scores the following marks in five tests 45, 54, 41, 57, 43. His score is not known for the sixth test. If the mean score is 48 in the six tests, then the standard deviation of the marks in six tests is

(2019 Main, 8 April II)

(a) $\frac{10}{3}$ (b) $\frac{10}{\sqrt{3}}$ (c) $\frac{100}{\sqrt{3}}$ (d) $\frac{100}{3}$

$\sqrt{\frac{100}{3}}$

45, 54, 41, 57, 43, x

$\frac{\overset{140}{45 + 54 + 41} + \overset{100}{57 + 43} + x}{6} = 48$

$240 + x = 288$

$\boxed{x = 48}$

$\boxed{var = \frac{\sum(x_i - \bar{x})^2}{n}}$

$= \frac{3^2 + 6^2 + 7^2 + 9^2 + 5^2}{6}$

$= \frac{50 + 90 + 49 + 11}{6}$

$= \frac{189 + 11}{6}$

$\frac{200}{6}$

The negation of $\sim s \vee (\sim r \wedge s)$ is equivalent to

(a) $s \wedge \sim r$ (b) $s \wedge (r \wedge \sim s)$ **(2015 Main)**

(c) $s \wedge (r \vee \sim s)$ (d) $s \wedge r$

$\rightarrow (\sim s \vee \sim r) \wedge (\sim s \vee s)$

T

$\boxed{s}$

$\rightarrow \sim(\sim s \vee \sim r)$

$\rightarrow \boxed{s \wedge r}$

Q2) If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n-1) : n \in N\}$, where N is the set of natural numbers, then $X \cup Y$ is equal to **(2014 Main)**

(a) N (b) $Y - X$ (c) X (d) Y

256 − 12 − 1

$X = \{0, 9, 54, 243 \ldots$

$Y = \{0, 9, 18, \ldots \}$

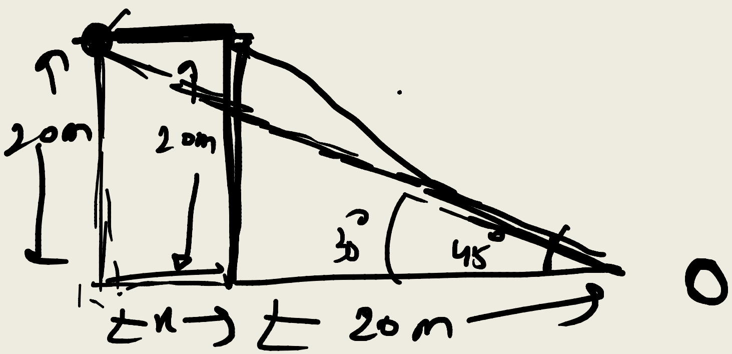
$\boxed{X \cup Y = Y}$

$\boxed{X \cap Y \Rightarrow X}$

Q. A bird is sitting on the top of a vertical pole 20 m high and its elevation from a point O on the ground is 45°. It flies off horizontally straight away from the point O. After 1 s, the elevation of the bird from O is reduced to 30°. Then, the speed (in m/s) of the bird is

(a) $40(\sqrt{2}-1)$ (b) $40(\sqrt{3}-\sqrt{2})$ **(2014 Main)**

(c) $20\sqrt{2}$ (d) $20(\sqrt{3}-1)$



$$\tan 30° = \frac{20}{x+20}$$

$$x+20 = 20\sqrt{3}$$

$$\boxed{x = 20(\sqrt{3}-1)}$$

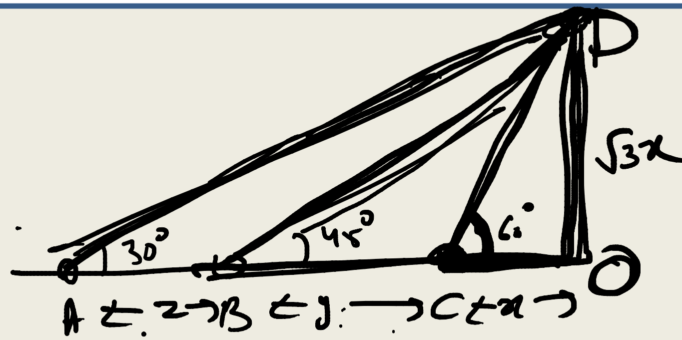
$$s = \frac{d}{1}$$

Speed $= 20(\sqrt{3}-1)$ m/s

(9) If the angles of elevation of the top of a tower from three collinear points. *A*, *B* and *C* on a line leading to the foot of the tower are 30°, 45° and 60° respectively, then the ratio *AB* : *BC* is **(2015 Main)**

~~(a)~~ $\sqrt{3}:1$ (b) $\sqrt{3}:\sqrt{2}$

(c) $1:\sqrt{3}$ (d) $2:3$



$\frac{z}{y}$

AB : BC

$\tan 60^\circ = \frac{OD}{x}$

$\tan 45^\circ = \frac{\sqrt{3}x}{x+y}$

$\boxed{y = (\sqrt{3}-1)x}$

$\tan 30^\circ = \frac{\sqrt{3}x}{x+y+z}$

$x+y+z = 3x$

$y+z = 2x$

$z = 2x - (\sqrt{3}-1)x$

$\boxed{z = x[3-\sqrt{3}]}$

$\frac{\cancel{x}(3-\sqrt{3})}{\cancel{x}[\sqrt{3}-1]}$

$\frac{\sqrt{3}\cancel{(\sqrt{3}-1)}}{\cancel{(\sqrt{3}-1)}}$

5 students of a class have an average height 150 cm and variance 18 cm^2. A new student, whose height is 156 cm, joined them. The variance (in cm^2) of the height of these six students is (2019 Main, 9 Jan I)

(a) 16 (b) 22 (c) 20 (d) 18

$(150+6)^2$

$22500+36+1800$

$\frac{(22518)\times 5+156^2}{6}$

$\bar{x} = 150$ cm

$\sigma^2 = 18$ cm^2

$\frac{x_1+x_2+x_3+x_4+x_5}{5} = 150$

$(x_1+x_2 \cdots x_5) = 150\times 5$

$(\text{Var}_{new}) = \frac{\sum x_i^2}{n} - (\bar{x})^2$

$\bar{X}_{new} = \frac{x_1+ - - - x_6}{6} = \frac{150\times 5+156}{6}$

$18 = \frac{(x_1^2+x_2^2+x_3^2 - x_5^2}{5} - (150)^2$

$= \frac{906}{6}$

$\boxed{\bar{X}_{new} = 151}$

$(150^2+18)\times 5 =$

$\text{Var}_{new} = \frac{x_1^2 - - x_6^2}{6} - (151)^2$

7821 −

$= \boxed{\frac{((150^2+18)\times 5) + (156)^2}{6} - (151)^2}$

Q)

If q is false and $p \wedge q \longleftrightarrow r$ is true, then which one of the following statements is a tautology?

(2019 Main, 11 Jan I)

(a) ~~$p \vee r$~~

(b) $(p \wedge r) \rightarrow (p \vee r)$ F → P   T

(c) $(p \vee r) \rightarrow (p \wedge r)$

(d) ~~$p \wedge r$~~

T → F

$p \wedge q \longleftrightarrow (r)$ True $q \rightarrow$ false

q	T
F	F

$p \wedge q$ (F) → F

r → F

p	q	p → q
T	F	F
F	T	T
F	F	T

$q \rightarrow F$, $r \rightarrow F$