

Chapter 6. Changing the Subject of a Formula

Ex 6.1

Answer 1.

Let the simple interest = I

Now simple interest on sum of money = product of sum of money, number of years and rate percentage = $\frac{A \times I \times R}{100}$

$$\text{As per the data } I = \frac{A \times I \times R}{100}$$

Answer 2.

Let radius = r

Therefore, cube of radius = r^3

One third of times π the cube of the radius = $\frac{1}{3} \pi r^3$

$$\text{As per the data: } V = \frac{1}{3} \pi r^3$$

Answer 3.

Centigrade temperature = C

Nine - fifths of the centigrade temperature = $\frac{9}{5} C$

32 more than nine - fifths of the centigrade temperature $C = \frac{9}{5} C + 32$

$$\text{As per the data: } F = \frac{9}{5} C + 32$$

Answer 4.

Sum of a ,b, c, d, e = $a+b+c+d+e$

Number of quantities = 5

Sum divided by the number of quantities = $\frac{a+b+c+d+e}{5}$

$$\text{As per the data: } M = \frac{a+b+c+d+e}{5}$$

Answer 5.

Object distance = u

Image distance = v

Reciprocal of Object distance = $\frac{1}{u}$

Reciprocal of Image distance = $\frac{1}{v}$

sum of reciprocals = $\frac{1}{u} + \frac{1}{v}$

Reciprocal of focal length = $\frac{1}{f}$

As per the data: $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$.

Answer 6.

Let the number of sides of the polygon = n

Number of sides of the polygon less 3 = $n-3$

As per the data: $d = n-3$

Answer 7.

Outer radius = R

Inner radius = r

The difference between the squares of outer radius R and inner radius

$$r = R^2 - r^2$$

π times the difference between the squares of outer radius R and inner radius

$$r = \pi(R^2 - r^2)$$

As per the data: $A = \pi(R^2 - r^2)$

Answer 8.

Cost price of 25a articles = $25a \times 30p$

Selling price of 25a articles = $25a \times 20q$

$$\text{Now, Profit} = \text{Rs} \frac{25a \times 20q - 25a \times 30p}{100} = \frac{50a(10q - 15p)}{100} = \text{Rs} \frac{a(10q - 15p)}{2}$$

As per the data: $P = \text{Rs} \frac{a(10q - 15p)}{2}$

Answer 9.

We know that 1 hour = 60 minutes

1 minute = 60 seconds

Number of minutes in x hours = $60x$

Number of minutes in y minutes = y

Number of minutes in z seconds = $\frac{z}{60}$

Total minutes = $60x + y + \frac{z}{60}$

Answer 10.

Cost of 12 apples = x rupees (1 dozen = 12)

Cost of 1 apple = $\frac{x}{12}$ rupees

Cost of 20 apples = $\frac{20x}{12}$ rupees

Cost of 20 mangoes = y rupees (1 score = 20)

Cost of 1 mango = $\frac{y}{20}$ rupees

Cost of 30 mangoes = $\frac{30y}{20}$ rupees

Total cost = $\frac{20x}{12} + \frac{30y}{20} = \frac{20x}{12} + \frac{3y}{2} = \frac{20x + 18y}{12} = \frac{10x + 9y}{6}$

As per the data: $C = \frac{10x + 9y}{6}$

Ex 6.2

Answer 1.

$$A = P \left(1 + \frac{R}{100} \right)^N$$

$$\Rightarrow \frac{A}{P} = \left(1 + \frac{R}{100} \right)^N$$

Taking Nth root both sides

$$\Rightarrow \left(\frac{A}{P} \right)^{\frac{1}{N}} = \left(1 + \frac{R}{100} \right)$$

$$\Rightarrow \left(\frac{A}{P} \right)^{\frac{1}{N}} - 1 = \frac{R}{100}$$

$$\Rightarrow 100 \left(\left(\frac{A}{P} \right)^{\frac{1}{N}} - 1 \right) = R$$

$$\Rightarrow R = 100 \left(\sqrt[N]{\frac{A}{P}} - 1 \right)$$

Answer 2.

$$T = 2\pi \sqrt{\frac{L}{G}}$$

$$\Rightarrow \frac{T}{2\pi} = \sqrt{\frac{L}{G}}$$

squaring both sides

$$\Rightarrow \left(\frac{T}{2\pi} \right)^2 = \frac{L}{G}$$

$$\Rightarrow G \left(\frac{T}{2\pi} \right)^2 = L$$

$$\Rightarrow L = \frac{GT^2}{4\pi^2}$$

Answer 3.

$$\begin{aligned}S &= ut + \frac{1}{2}at^2 \\ \Rightarrow S - ut &= \frac{1}{2}at^2 \\ \Rightarrow 2(S - ut) &= at^2 \\ \Rightarrow \frac{2(S - ut)}{t^2} &= a \\ \Rightarrow a &= \frac{2(S - ut)}{t^2}\end{aligned}$$

Answer 4.

$$\begin{aligned}\frac{x^2}{a^2} + \frac{y^2}{b^2} &= 1 \\ \Rightarrow \frac{x^2}{a^2} &= 1 - \frac{y^2}{b^2} \\ \Rightarrow x^2 &= a^2 \left(1 - \frac{y^2}{b^2}\right) = a^2 \left(\frac{b^2 - y^2}{b^2}\right) \\ \text{Taking square root both sides} \\ \Rightarrow x &= \sqrt{a^2 \left(\frac{b^2 - y^2}{b^2}\right)} = \frac{a}{b} \sqrt{b^2 - y^2}\end{aligned}$$

Answer 5.

$$\begin{aligned}S &= \frac{a(r^n - 1)}{r - 1} \\ \Rightarrow S(r - 1) &= a(r^n - 1) \\ \Rightarrow \frac{S(r - 1)}{(r^n - 1)} &= a \\ \Rightarrow a &= \frac{S(r - 1)}{(r^n - 1)}\end{aligned}$$

Answer 6.

$$\begin{aligned}\frac{1}{R} &= \frac{1}{r_1} + \frac{1}{r_2} \\ \Rightarrow \frac{1}{r_2} &= \frac{1}{R} - \frac{1}{r_1} \\ \Rightarrow \frac{1}{r_2} &= \frac{r_1 - R}{r_1 R} \\ \Rightarrow r_2 &= \frac{R r_1}{r_1 - R}\end{aligned}$$

Answer 7.

$$\begin{aligned}x &= \sqrt{\frac{a+b}{a-b}} \\ \text{squaring both sides} \\ \Rightarrow x^2 &= \frac{a+b}{a-b} \\ \Rightarrow x^2(a-b) &= a+b \\ \Rightarrow x^2 a - x^2 b &= a+b \\ \Rightarrow x^2 a - a &= b + x^2 b \\ \Rightarrow a(x^2 - 1) &= b(x^2 + 1) \\ \Rightarrow a &= \frac{b(x^2 + 1)}{(x^2 - 1)}\end{aligned}$$

Answer 8.

$$\begin{aligned}W &= pq + \frac{1}{2} W y^2 \\ \Rightarrow W - pq &= \frac{1}{2} W y^2 \\ \Rightarrow 2(W - pq) &= W y^2 \\ \Rightarrow \frac{2(W - pq)}{W} &= y^2 \\ \Rightarrow Y &= \sqrt{\frac{2(W - pq)}{W}}\end{aligned}$$

Answer 9.

$$\begin{aligned}I &= \frac{NG}{R + Ny} \\ \Rightarrow I(R + Ny) &= NG \\ \Rightarrow IR + INy &= NG \\ \Rightarrow N(Iy - G) &= -IR \\ \Rightarrow N &= \frac{-IR}{(Iy - G)} = \frac{IR}{G - Iy}\end{aligned}$$

Answer 10.

$$\begin{aligned}K &= \frac{1}{2}MV^2 \\ \Rightarrow 2K &= MV^2 \\ \Rightarrow \frac{2K}{M} &= V^2 \\ \Rightarrow \sqrt{\frac{2K}{M}} &= V\end{aligned}$$

Answer 11.

$$\begin{aligned}S &= \frac{n}{2}\{2a + (n - 1)d\} \\ \Rightarrow 2S &= 2an + n(n - 1)d \\ \Rightarrow 2S - 2an &= n(n - 1)d \\ \Rightarrow 2(S - an) &= n(n - 1)d \\ \Rightarrow d &= \frac{2(S - an)}{n(n - 1)}\end{aligned}$$

Answer 12.

$$\begin{aligned}R^2 &= 4\pi(R_1^2 - R_2^2) \\ \Rightarrow R^2 &= 4\pi R_1^2 - 4\pi R_2^2 \\ \Rightarrow 4\pi R_2^2 &= 4\pi R_1^2 - R^2 \\ \Rightarrow R_2^2 &= \frac{4\pi R_1^2 - R^2}{4\pi} \\ \Rightarrow R_2 &= \sqrt{\frac{4\pi R_1^2 - R^2}{4\pi}}\end{aligned}$$

Answer 13.

$$\begin{aligned}R &= \frac{m_1 B + m_2 A}{m_1 + m_2} \\ \Rightarrow R(m_1 + m_2) &= m_1 B + m_2 A \\ \Rightarrow R(m_1 + m_2) - m_1 B &= m_2 A \\ \Rightarrow \frac{R(m_1 + m_2) - m_1 B}{m_2} &= A\end{aligned}$$

Answer 14.

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ \Rightarrow 2ax &= -b \pm \sqrt{b^2 - 4ac} \\ \Rightarrow 2ax + b &= \pm \sqrt{b^2 - 4ac} \\ \text{Taking square both sides} \\ \Rightarrow (2ax + b)^2 &= b^2 - 4ac \\ \Rightarrow 4ac &= b^2 - (2ax + b)^2 \\ \Rightarrow c &= \frac{b^2 - (2ax + b)^2}{4a}\end{aligned}$$

Answer 15.

$$\begin{aligned}T &= 2\pi \sqrt{\frac{k^2 + h^2}{hg}} \\ \Rightarrow \frac{T}{2\pi} &= \sqrt{\frac{k^2 + h^2}{hg}} \\ \text{Squaring both sides} \\ \Rightarrow \left(\frac{T}{2\pi}\right)^2 &= \frac{k^2 + h^2}{hg} \\ \Rightarrow hg \left(\frac{T}{2\pi}\right)^2 - h^2 &= k^2 \\ \Rightarrow k &= \sqrt{\frac{T^2 hg}{4\pi^2} - h^2}\end{aligned}$$

Answer 16.

$$mx + ny = p$$

Substitute $y = ax + b$ in the above equation

$$mx + n(ax + b) = p$$

$$\Rightarrow mx + anx + bn = p$$

$$\Rightarrow x(m + an) + bn = p$$

$$\Rightarrow x(m + an) = p - bn$$

$$\Rightarrow x = \frac{p - bn}{m + an}$$

Answer 17.

$$A = \pi r^2 \dots (i) \text{ and } C = 2\pi r \dots (ii)$$

Divide (i) by (ii)

$$\frac{A}{C} = \frac{\pi r^2}{2\pi r}$$

$$\Rightarrow \frac{A}{C} = \frac{r}{2}$$

$$\Rightarrow r = \frac{2A}{C} \dots (\text{Multiplying throughout by } r)$$

Answer 18.

$$V = \pi r^2 h \text{ and } S = 2\pi r^2 + 2\pi r h$$

$$S = 2\pi r^2 + 2\pi r h$$

$$\Rightarrow 2\pi r h = S - 2\pi r^2$$

$$\Rightarrow h = \frac{S - 2\pi r^2}{2\pi r}$$

Substitute h in $V = \pi r^2 h$

$$\Rightarrow V = \pi r^2 \left(\frac{S - 2\pi r^2}{2\pi r} \right)$$

$$\Rightarrow V = r \left(\frac{S - 2\pi r^2}{2} \right)$$

$$\Rightarrow V = \frac{Sr}{2} - \pi r^3$$

Answer 19.

$$3ax + 2b^2 = 3bx + 2a^2$$

$$\Rightarrow 3ax - 3bx = 2a^2 - 2b^2$$

$$\Rightarrow x(3a - 3b) = 2a^2 - 2b^2$$

$$\Rightarrow x = \frac{2a^2 - 2b^2}{3a - 3b}$$

$$\Rightarrow x = \frac{2(a^2 - b^2)}{3(a - b)}$$

$$\Rightarrow x = \frac{2(a + b)(a - b)}{3(a - b)}$$

$$\Rightarrow x = \frac{2(a + b)}{3} \quad \dots (\because a \neq b)$$

Answer 20.

$$\text{Given } b = \frac{2a}{a - 2}, \text{ and } c = \frac{4b - 3}{3b + 4}$$

$$\text{Substituting } b = \frac{2a}{a - 2} \text{ in } c = \frac{4b - 3}{3b + 4}$$

$$c = \frac{4\left(\frac{2a}{a - 2}\right) - 3}{3\left(\frac{2a}{a - 2}\right) + 4}$$

$$\Rightarrow c = \frac{\frac{8a}{a - 2} - 3}{\frac{6a}{a - 2} + 4}$$

$$\Rightarrow c = \frac{\frac{8a - 3(a - 2)}{a - 2}}{\frac{6a + 4(a - 2)}{a - 2}}$$

$$\Rightarrow c = \frac{8a - 3(a - 2)}{6a + 4(a - 2)}$$

$$\Rightarrow c = \frac{8a - 3a + 6}{6a + 4a - 8}$$

$$\Rightarrow c = \frac{5a + 6}{10a - 8}$$

Ex 6.3**Answer 1.**

$$R = \frac{h}{2}(a - b)$$

$$\Rightarrow 2R = h(a - b)$$

$$\Rightarrow h = \frac{2R}{a - b}$$

Substituting $R=108, a=16$ and $b=12$, we get

$$h = \frac{2 \times 108}{16 - 12} = \frac{2 \times 108}{4} = 54$$

Answer 2.

$$v^2 = u^2 + 2as$$

$$\Rightarrow v^2 - u^2 = 2as$$

$$\Rightarrow s = \frac{v^2 - u^2}{2a}$$

Substituting $u=3, a=2$ and $v=5$, we get

$$s = \frac{5^2 - 3^2}{2 \times 2} = \frac{25 - 9}{4} = \frac{16}{4} = 4$$

Answer 3.

$$x = \frac{1 - y^2}{1 + y^2}$$

$$\Rightarrow x(1 + y^2) = 1 - y^2$$

$$\Rightarrow x + xy^2 = 1 - y^2$$

$$\Rightarrow xy^2 + y^2 = 1 - x$$

$$\Rightarrow y^2(x + 1) = 1 - x$$

$$\Rightarrow y^2 = \frac{1 - x}{1 + x}$$

$$\Rightarrow y = \sqrt{\frac{1 - x}{1 + x}}$$

Substituting $x = \frac{3}{5}$, we get

$$y = \sqrt{\frac{1 - \frac{3}{5}}{1 + \frac{3}{5}}} = \sqrt{\frac{\frac{2}{5}}{\frac{8}{5}}} = \sqrt{\frac{2}{8}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

Answer 4.

$$S = \frac{n}{2} \{2a + (n - 1)d\}$$

$$\Rightarrow 2S = n\{2a + (n - 1)d\}$$

$$\Rightarrow \frac{2S}{n} = 2a + (n - 1)d$$

$$\Rightarrow \frac{2S}{n} - (n - 1)d = 2a$$

$$\Rightarrow \left\{ \frac{S}{n} - \frac{(n - 1)d}{2} \right\} = a$$

Substituting $S=50, n=10$ and $d=2$, we get

$$a = \left\{ \frac{S}{n} - \frac{(n - 1)d}{2} \right\} = \left\{ \frac{50}{10} - \frac{9 \times 2}{2} \right\} = 5 - 9 = -4$$

Answer 5.

$$a = 1 - \frac{2b}{cx - b}$$

$$\Rightarrow a - 1 = -\frac{2b}{cx - b}$$

$$\Rightarrow (a - 1)(cx - b) + 2b = 0$$

$$\Rightarrow acx - ab - cx + 3b = 0$$

$$\Rightarrow x(ac - c) + b(3 - a) = 0$$

$$\Rightarrow x(a - 1) = -b(3 - a)$$

$$\Rightarrow x = \frac{b(a - 3)}{a - 1}$$

Substituting $a=5$, $b=12$ and $c=2$, we get

$$x = \frac{12(5 - 3)}{2(5 - 1)} = \frac{12 \times 2}{2 \times 4} = 3$$

Answer 6.

$$k = \sqrt{\frac{hg}{d^2} - a^2}$$

Squaring both sides, we get

$$\Rightarrow k^2 = \frac{hg}{d^2} - a^2$$

$$\Rightarrow k^2 + a^2 = \frac{hg}{d^2}$$

$$\Rightarrow (k^2 + a^2)d^2 = hg$$

$$\Rightarrow h = \frac{(k^2 + a^2)d^2}{g}$$

Substituting $k=-2$, $a=-3$, $d=8$ and $g=32$, we get

$$h = \frac{((-2)^2 + (-3)^2)(8)^2}{32} = \frac{(4 + 9)64}{32} = 26$$

Answer 7.

$$y = \frac{1-x^2}{1+x^2}$$

$$\Rightarrow y(1+x^2) = 1-x^2$$

$$\Rightarrow y + yx^2 = 1-x^2$$

$$\Rightarrow yx^2 + x^2 = 1-y$$

$$\Rightarrow x^2(1+y) = 1-y$$

$$\Rightarrow x^2 = \frac{1-y}{1+y}$$

$$\Rightarrow x = \sqrt{\frac{1-y}{1+y}}$$

Substituting $y = \frac{1}{2}$, we get

$$x = \sqrt{\frac{1-\frac{1}{2}}{1+\frac{1}{2}}} = \sqrt{\frac{1}{3}}$$

Answer 8.

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\Rightarrow \frac{y}{b} = 1 - \frac{x}{a}$$

$$\Rightarrow \frac{y}{b} = \frac{a-x}{a}$$

$$\Rightarrow y = b \left(1 - \frac{x}{a} \right)$$

$$\Rightarrow y = b - \frac{b}{a}x$$

Substituting $a=2, b=8$ and $x=5$, we get

$$y = 8 - \frac{8}{2} \times 5 = -12$$

Answer 9.

$$\begin{aligned}x &= \frac{my}{14 - mt} \\ \Rightarrow (14 - mt)x &= my \\ \Rightarrow 14x - mt x &= my \\ \Rightarrow -mt x - my &= -14x \\ \Rightarrow m(tx + y) &= 14x \\ \Rightarrow m &= \frac{14x}{tx + y}\end{aligned}$$

Substituting $x=6, y=10$ and $t=3$

$$m = \frac{14 \times 6}{3 \times 6 + 10} = \frac{14 \times 6}{28} = 3$$

Answer 10.

$$\begin{aligned}M &= L + \frac{1}{F} \left(\frac{1}{2} N - C \right) \times I \\ \Rightarrow M - L &= \frac{1}{F} \left(\frac{1}{2} N - C \right) \times I \\ \Rightarrow F(M - L) &= \left(\frac{1}{2} N - C \right) \times I \\ \Rightarrow F(M - L) &= \left(\frac{N - 2C}{2} \right) \times I \\ \Rightarrow \frac{2F(M - L)}{(N - 2C)} &= I\end{aligned}$$

Substituting the values of $M=44, L=20, F=15, N=50$ and $C=30$, we get

$$\begin{aligned}I &= \frac{2F(M - L)}{(N - 2C)} = \frac{2 \times 15(44 - 20)}{50 - 2 \times 30} \\ &= \frac{30 \times 24}{24} = 30\end{aligned}$$

Answer 11.

$$\begin{aligned}v^2 &= u^2 - 2gh \\ \Rightarrow 2gh &= u^2 - v^2 \\ \Rightarrow g &= \frac{u^2 - v^2}{2h}\end{aligned}$$

Substituting the values of $v=9.8, u=41.5$ and $h=25.4$.

$$\begin{aligned}g &= \frac{41.5^2 - 9.8^2}{2 \times 25.4} = \frac{(41.5 + 9.8)(41.5 - 9.8)}{50.8} = \frac{51.3 \times 31.7}{50.8} \\ &= 32.01 = 32\end{aligned}$$

Answer 12.

$$D = \sqrt{\frac{f+p}{f-p}}$$

squaring both sides, we get

$$\begin{aligned}\Rightarrow D^2 &= \left(\frac{f+p}{f-p}\right) \\ \Rightarrow D^2(f-p) &= (f+p) \\ \Rightarrow D^2f - D^2p &= f+p \\ \Rightarrow D^2f - f &= p + D^2p \\ \Rightarrow f(D^2 - 1) &= p(D^2 + 1) \\ \Rightarrow f &= \frac{p(D^2 + 1)}{(D^2 - 1)}\end{aligned}$$

Substituting the values of $D=13$ and $p=21$

$$f = \frac{21(13^2 + 1)}{(13^2 - 1)} = \frac{21 \times 170}{168} = 21.25$$

Answer 13.

$$y = \frac{2z + 1}{2z - 1}$$

$$\Rightarrow (2z - 1)y = 2z + 1$$

$$\Rightarrow 2zy - y = 2z + 1$$

$$\Rightarrow 2zy - 2z = 1 + y$$

$$\Rightarrow z(2y - 1) = 1 + y$$

$$\Rightarrow z = \frac{1 + y}{2y - 1}$$

$$x = \frac{y + 1}{y - 1}$$

$$\Rightarrow x = \frac{\left(\frac{2z + 1}{2z - 1}\right) + 1}{\left(\frac{2z + 1}{2z - 1}\right) - 1} = \frac{2z + 1 + 2z - 1}{2z + 1 - 2z + 1}$$

$$= \frac{4z}{2} = 2z$$

$$\Rightarrow z = \frac{x}{2}$$

Substituting $x = 34$, we get

$$z = \frac{34}{2} = 17$$

Answer 14.

$$a = b(1 + ct)$$

$$\Rightarrow a = b + bct$$

$$\Rightarrow bct = a - b$$

$$\Rightarrow c = \frac{a - b}{bt}$$

Substituting $a = 1100$, $b = 100$ and $t = 4$, we get

$$c = \frac{1100 - 100}{100 \times 4} = 2.5$$

Answer 15.

Volume of cylinder = V

Product of π and square of radius r and the height $h = \pi r^2 h$

$$\text{i.e } V = \pi r^2 h$$

$$V = \pi r^2 h$$

$$\Rightarrow \frac{V}{h\pi} = r^2$$

$$\Rightarrow r = \sqrt{\frac{V}{\pi h}}$$

When $V = 44\text{cm}^3$, $\pi = 22/7$, $h = 14\text{cm}$

$$\Rightarrow r = \sqrt{\frac{44}{\frac{22}{7} \times 14}} = \sqrt{1} = 1\text{cm}$$

Answer 16.

Volume of cone = V

Product of one third of π and square of radius r of the base and the height

$$V = \frac{1}{3} \pi r^2 h$$

$$\text{So, } V = \frac{1}{3} \pi r^2 h$$

$$\Rightarrow \frac{3V}{\pi h} = r^2$$

$$\Rightarrow r = \sqrt{\frac{3V}{\pi h}}$$

Substituting $V = 1232\text{cm}^3$, $\pi = \frac{22}{7}$, $h = 24\text{cm}$

$$\Rightarrow r = \sqrt{\frac{3 \times 1232}{\frac{22}{7} \times 24}} = \sqrt{49} = 7\text{cm}$$

Answer 17.

Given that when $P = 4$, $V = 2\frac{1}{2} = \frac{5}{2}$

$$PV = C$$

$$\Rightarrow 4\left(\frac{5}{2}\right) = C$$

$$\Rightarrow C = 10$$

If $V = 4$, then

$$PV = C$$

$$\Rightarrow P(4) = (10)$$

$$\Rightarrow P = \frac{10}{4}$$

$$\Rightarrow P = \frac{5}{2}$$

Answer 18A.

$$E = \frac{1}{2}m u^2 + mgh$$

$$\Rightarrow E = m\left(\frac{1}{2} u^2 + gh\right)$$

$$\Rightarrow m = \frac{E}{\frac{1}{2} u^2 + gh}$$

$$\Rightarrow m = \frac{E}{\frac{u^2 + 2gh}{2}}$$

$$\Rightarrow m = \frac{2E}{u^2 + 2gh}$$

Answer 18B.

$$E = \frac{1}{2} m u^2 + mgh$$

$$\Rightarrow E = m \left(\frac{1}{2} u^2 + gh \right)$$

$$\Rightarrow m = \frac{E}{\frac{1}{2} u^2 + gh}$$

$$\Rightarrow m = \frac{E}{\frac{u^2 + 2gh}{2}}$$

$$\Rightarrow m = \frac{2E}{u^2 + 2gh}$$

Given that $v = 2$, $g = 10$, $h = 5$ and $E = 104$

$$\Rightarrow m = \frac{2(104)}{(2)^2 + 2(10)(5)}$$

$$\Rightarrow m = \frac{208}{4 + 100}$$

$$\Rightarrow m = 2$$

Answer 19.

$$s = \frac{n}{2} [2a + (n-1)d]$$

$$\Rightarrow s = an + \frac{n(n-1)d}{2}$$

$$\Rightarrow s - an = \frac{n(n-1)d}{2}$$

$$\Rightarrow \left(\frac{2s - 2an}{n(n-1)} \right) = d$$

$$\Rightarrow d = \frac{2}{n(n-1)} (s - an)$$

Given that $n = 3$, $a = n + 1$ and $s = 18$

Since $a = n + 1 \Rightarrow a = 3 + 1 = 4$

Substituting we get

$$\Rightarrow d = \frac{2}{3(3-1)} (18 - (4)(3))$$

$$\Rightarrow d = \frac{2}{3(2)} (18 - 12)$$

$$\Rightarrow d = \frac{1}{3} (6)$$

$$\Rightarrow d = 2$$

Answer 20.

Radius of bigger circle = R

Radius of smaller circle = r

$$\text{Area} = A = \pi(R^2 - r^2)$$

$$\Rightarrow A = \pi(R^2 - r^2)$$

$$\Rightarrow \frac{A}{\pi} = R^2 - r^2$$

$$\Rightarrow r^2 = R^2 - \frac{A}{\pi}$$

$$\Rightarrow r = \sqrt{R^2 - \frac{A}{\pi}}$$

Putting $A = 88\text{cm}^2$ and $R = 8\text{cm}$

$$\Rightarrow r = \sqrt{8^2 - \frac{88}{\frac{22}{7}}} = 6\text{cm}$$