

Excel Matematik SPM
Tingkatan 5 Bab 1
Ubahan
Penyelesaian Lengkap

Praktis Formatif 1.1

1

x	9	27	45	63
y	8	24	40	56
$\frac{y}{x}$	$\frac{8}{9}$	$\frac{8}{9}$	$\frac{8}{9}$	$\frac{8}{9}$

Oleh sebab nilai $\frac{y}{x} = \frac{8}{9}$ (pemalar), maka y berubah secara langsung dengan x .

2

x	12	20	50
y	10	64	400
$\frac{y}{x}$	$\frac{5}{6}$	$\frac{16}{5}$	2

Oleh sebab $\frac{y}{x}$ bukan pemalar, maka y tidak berubah secara langsung dengan x .

3 (a) $m \propto \sqrt{n}$

$$m = k\sqrt{n} \text{ [} k \text{ ialah pemalar.]}$$

$$m = 1 \text{ apabila } n = 16$$

$$1 = k\sqrt{16}$$

$$k = \frac{1}{4}$$

$$m = \frac{1}{4}\sqrt{n}$$

(b) Apabila $n = 36$,

$$m = \frac{1}{4}\sqrt{36} = \frac{3}{2}$$

4 $y \propto x^{\frac{1}{3}}$

$$y = kx^{\frac{1}{3}}$$

Diberi $x = 8$ dan $y = 10$,

$$10 = k(8)^{\frac{1}{3}} \text{ [} k \text{ ialah pemalar.]}$$

$$10 = 2k$$

$$k = 5$$

$$y = 5x^{\frac{1}{3}}$$

Diberi $x = p$ dan $y = 15$,

$$15 = 5p^{\frac{1}{3}}$$

$$p^{\frac{1}{3}} = 3$$

$$p = 3^3 = 27$$

5 (a) $p \propto x^3 y^{\frac{1}{2}} z^{\frac{1}{3}}$

$$p = kx^3 y^{\frac{1}{2}} z^{\frac{1}{3}} \text{ [} k \text{ ialah pemalar.]}$$

Apabila $x = 3$, $y = \frac{1}{9}$ dan $z = 64$, maka

$$p = 72.$$

$$72 = k(3)^3 \left(\frac{1}{9}\right)^{\frac{1}{2}} (64)^{\frac{1}{3}}$$

$$72 = k(27) \left(\frac{1}{3}\right) (4)$$

$$k = \frac{72(3)}{27(4)} = 2$$

$$\therefore p = 2x^3 y^{\frac{1}{2}} z^{\frac{1}{3}}$$

(b) $p = 2x^3 y^{\frac{1}{2}} z^{\frac{1}{3}}$

Apabila $x = 2$, $y = \frac{1}{81}$, $z = 125$,

$$p = 2(2)^3 \left(\frac{1}{81}\right)^{\frac{1}{2}} (125)^{\frac{1}{3}}$$

$$p = 8\frac{8}{9}$$

6 (a) $M \propto vn$

$$M = kvn \text{ [} k \text{ ialah pemalar.]}$$

$M = 60$ apabila $v = 1000$ dan $n = 3$.

$$60 = k(1000)(3)$$

$$k = \frac{60}{3000}$$

$$k = \frac{1}{50}$$

$$M = \frac{1}{50}vn$$

(b) Apabila $v = 1500$ dan $n = 4$,

$$M = \frac{1}{50}(1500)(4) = 120$$

7 (a) $V \propto j^3$

$V = kj^3$ [k ialah pemalar.]

Apabila $j = 7$, $V = \frac{2156}{3}$

$\frac{2156}{3} = k(7)^3$

$k = \frac{2156}{3} \times \frac{1}{343}$

$k = \frac{44}{21}$

$V = \frac{44}{21} j^3$

(b) Apabila $j = 3$,

$V = \frac{44}{21} (3)^3$

$V = 56 \frac{4}{7} \text{ cm}^3$

8 $V \propto T$

$V = kT$ [k ialah pemalar.]

$V = 13$ apabila $T = 650$

$13 = k(650)$

$k = \frac{13}{650}$

$V = \frac{13}{650} T$

Apabila $T = 400$,

$V = \frac{13}{650} (400) = 8$

Praktis Formatif 1.2

1

x	2	4	5	8
y	10	5	4	2.5
xy	20	20	20	20

Oleh sebab nilai $xy = 20$ (pemalar), maka y berubah secara songsang dengan x.

2 $m \propto \frac{1}{y^3}$

$m = k \left(\frac{1}{y^3} \right)$ [k ialah pemalar.]

$m = 1$ apabila $y = 8$

$1 = k \left(\frac{1}{8^3} \right)$

$1 = k \left(\frac{1}{2} \right)$

$k = 2$

$m = 2 \left(\frac{1}{y^3} \right)$

Apabila $m = 10$,

$10 = 2 \left(\frac{1}{y^3} \right)$

$y^3 = \frac{1}{5}$

$y = \frac{1}{125}$

3 $y \propto \frac{1}{x^3}$

$y = \frac{k}{x^3}$ [k ialah pemalar.]

$y = 5$ apabila $x = 2$

$5 = \frac{k}{2^3}$

$k = 40$

$y = \frac{40}{x^3}$

Apabila $y = \frac{5}{8}$,

$\frac{5}{8} = \frac{40}{x^3}$

$x^3 = 40 \times \frac{8}{5}$

$x^3 = 64$
 $x = 4$

$$4 \quad h \propto \frac{1}{r^2}$$

$$h = k \frac{1}{r^2} \text{ [} k \text{ ialah pemalar.]}$$

$$h = 7 \text{ apabila } r = 3$$

$$7 = k \left(\frac{1}{3^2} \right)$$

$$k = 63$$

$$h = \frac{63}{r^2}$$

$$\text{Apabila } r = 5,$$

$$h = \frac{63}{5^2} = 2.52 \text{ cm}$$

$$5 \quad I \propto \frac{1}{R}$$

$$I = \frac{k}{R} \text{ [} k \text{ ialah pemalar.]}$$

$$\text{Diberi } I = 0.4 \text{ dan } R = 30,$$

$$0.4 = \frac{k}{30}$$

$$k = 12$$

$$I = \frac{12}{R}$$

$$\text{Apabila } R = 48,$$

$$I = \frac{12}{48} = 0.25$$

Praktis Formatif 1.3

$$1 \quad w \propto \frac{x^2}{\sqrt{y}}$$

$$w = \frac{kx^2}{\sqrt{y}} \text{ [} k \text{ ialah pemalar.]}$$

$$\text{Diberi } w = 4, x = 2 \text{ dan } y = 9,$$

$$4 = \frac{k(2)^2}{\sqrt{9}}$$

$$k = 3$$

$$w = \frac{3x^2}{\sqrt{y}}$$

$$\text{Apabila } w = 8, x = p \text{ dan } y = 36,$$

$$8 = \frac{3p^2}{\sqrt{36}}$$

$$8 = \frac{3p^2}{6}$$

$$p^2 = 16$$

$$p = \pm 4$$

$$2 \quad p \propto \frac{q^2}{r}$$

$$p = \frac{kq^2}{r} \text{ [} k \text{ ialah pemalar.]}$$

$$\text{Diberi } p = 25, q = 5, r = 3,$$

$$25 = \frac{k(5)^2}{3}$$

$$k = 3$$

$$p = \frac{3q^2}{r}$$

$$\text{Apabila } p = 12, q = m \text{ dan } r = 9,$$

$$12 = \frac{3m^2}{9}$$

$$m^2 = 36$$

$$m = \pm 6$$

$$3 \text{ (a) } K \propto mv^2$$

$$K = kmv^2 \text{ [} k \text{ ialah pemalar.]}$$

$$\text{Jika } m = 3 \text{ dan } v = 12, \text{ maka } K = 216.$$

$$216 = k(3)(12)^2$$

$$k = \frac{1}{2}$$

$$K = \frac{1}{2}mv^2$$

$$\text{Apabila } K = 250 \text{ dan } v = 10,$$

$$250 = \frac{1}{2}m(10)^2$$

$$250 = 50m$$

$$m = 5 \text{ kg}$$

$$\text{(b) Apabila } m = 6 \text{ dan } K = 300,$$

$$300 = \frac{1}{2}(6)v^2$$

$$v^2 = 100$$

$$v = 10 \text{ m s}^{-1}$$

$$4 \quad F \propto \frac{q_1q_2}{r^2}$$

$$F = \frac{kq_1q_2}{r^2} \text{ [} k \text{ ialah pemalar.]}$$

$$125 = \frac{k(1.0 \times 10^{-5})(2.0 \times 10^{-5})}{0.12^2}$$

$$125 = \frac{k(1.0 \times 10^{-5})(2.0 \times 10^{-5})}{0.12^2}$$

$$1.8 = k(2.0 \times 10^{-10})$$

$$k = \frac{1.8}{(2.0 \times 10^{-10})}$$

$$k = 9 \times 10^9$$

Praktis Sumatif 1**Soalan Objektif**

1

x	3	5	7
y	12	20	60
$\frac{y}{x}$	4	4	$8\frac{4}{7}$

Oleh sebab $\frac{y}{x}$ bukan pemalar, maka y tidak

berubah secara langsung dengan x .

Jawapan: B

2 $m \propto n$

$m = kn$ [k ialah pemalar.]

Apabila $n = 3$, $m = 9$

$9 = k(3)$

$k = 3$

$m = 3n$

Jawapan: A

3

x	2	6	8
y	24	8	6
xy	48	48	48

Oleh sebab nilai xy ialah pemalar, maka y berubah secara songsang dengan x .

Jawapan: C

4 $h \propto \frac{1}{t^3}$

$h = \frac{k}{t^3}$ [k ialah pemalar.]

Apabila $t = 2$, $h = 4$

$4 = \frac{k}{2^3}$

$k = 32$

$h = \frac{32}{t^3}$

Jawapan: A

5 $y \propto \frac{x^2}{p}$

$y = \frac{kx^2}{p}$ [k ialah pemalar.]

Apabila $x = 2$, $y = 4$ dan $p = 3$,

$4 = \frac{k(2)^2}{3}$

$k = 3$

$y = \frac{3x^2}{p}$

Apabila $y = 25$ dan $p = 3$,

$25 = \frac{3x^2}{3}$

$x^2 = 25$

$x = \pm 5$

Jawapan: B

6 $m \propto \frac{n}{\sqrt{h}}$

$m = \frac{kn}{\sqrt{h}}$ [k ialah pemalar.]

Apabila $n = 8$, $h = 16$ dan $m = 2$,

$2 = \frac{k(8)}{\sqrt{16}}$

$2 = \frac{k(8)}{4}$

$k = 1$

$m = \frac{n}{\sqrt{h}}$

Jawapan: A

Soalan Struktur1 $p \propto q$

$p = kq$ [k ialah pemalar.]

$q = 5$ apabila $p = 20$

$20 = k(5)$

$k = 4$

$p = 4q$

Jika $q = 8$,

$p = 4(8) = 32$

2 $y \propto x^2$

$y = kx^2$ [k ialah pemalar.]

Apabila $x = 4$, $y = 48$,

$48 = k(4)^2$

$k = 3$

$y = 3x^2$

Apabila $x = 6$ dan $y = p$,

$$p = 3(6)^2 = 108$$

$$3 \quad p \propto \sqrt{q}$$

$$p = k\sqrt{q} \quad [k \text{ ialah pemalar.}]$$

$$p = 10 \text{ apabila } q = 25$$

$$10 = k\sqrt{25}$$

$$k = 2$$

$$p = 2\sqrt{q}$$

$$\text{Jika } q = 100,$$

$$p = 2\sqrt{100} = 20$$

$$4 \quad y \propto \frac{x^{\frac{1}{2}} p^{\frac{1}{3}}}{q^3}$$

$$y = k \frac{x^{\frac{1}{2}} p^{\frac{1}{3}}}{q^3} \quad [k \text{ ialah pemalar.}]$$

$$\text{Apabila } x = 16, p = 125, q = 2, \text{ maka } y = 5,$$

$$5 = k \left[\frac{16^{\frac{1}{2}} 125^{\frac{1}{3}}}{2^3} \right]$$

$$5 = k \left[\frac{4(5)}{8} \right]$$

$$k = 2$$

$$y = \frac{2x^{\frac{1}{2}} p^{\frac{1}{3}}}{q^3}$$

$$\text{Apabila } x = 4, p = 8 \text{ dan } q = 4,$$

$$y = \frac{2(4)^{\frac{1}{2}} (8)^{\frac{1}{3}}}{4^3} = \frac{1}{8}$$

$$5 \text{ (a) } T \propto j$$

$$T = kj \quad [k \text{ ialah pemalar.}]$$

$$T = 10 \text{ apabila } j = 5.$$

$$10 = 5k$$

$$k = 2$$

$$T = 2j$$

$$\text{(b) Apabila } j = 3.5,$$

$$T = 2(3.5) = 7 \text{ g cm}^{-3}$$

$$6 \text{ (a) } v \propto \sqrt{T}$$

$$v = k\sqrt{T} \quad [k \text{ ialah pemalar.}]$$

$$T = 100 \text{ apabila } v = 5$$

$$5 = k\sqrt{100}$$

$$5 = k(10)$$

$$k = 0.5$$

$$v = 0.5\sqrt{T}$$

$$\text{(b) (i) Apabila } T = 64,$$

$$v = 0.5\sqrt{64} = 4 \text{ m s}^{-1}$$

$$\text{(ii) Apabila } v = 8,$$

$$8 = 0.5\sqrt{T}$$

$$\sqrt{T} = 16$$

$$T = 256 \text{ J}$$

$$7 \quad N \propto dv^2$$

$$N = kdv^2 \quad [k \text{ ialah pemalar.}]$$

$$N = 7 \frac{1}{2} \text{ apabila } d = 30 \text{ dan } v = 18$$

$$\frac{15}{2} = k(30)(18)^2$$

$$k = \frac{1}{1296}$$

$$N = \frac{1}{1296} dv^2$$

$$N = \frac{1}{1296} (200)(36)^2$$

$$N = 200 \text{ tong}$$

$$8 \quad R \propto Av$$

$$R = kAv \quad [k \text{ ialah pemalar.}]$$

$$\text{Apabila } A = 25 \text{ dan } v = 40, \text{ maka } R = 225.$$

$$225 = k(25)(40)$$

$$k = \frac{9}{40}$$

$$R = \frac{9}{40} Av$$

$$\text{Apabila } v = 350 \text{ dan } R = 236.25,$$

$$236.25 = \frac{9}{40} A(350)$$

$$A = \frac{236.25}{350} \times \frac{40}{9}$$

$$A = 3 \text{ m}^2$$

$$9 \quad q \propto \frac{1}{p^2}$$

$$q = \frac{k}{p^2} \quad [k \text{ ialah pemalar.}]$$

$$\text{Diberi } p = 1 \text{ dan } q = 12,$$

$$12 = \frac{k}{1^2}$$

$$k = 12$$

$$q = \frac{12}{p^2}$$

$$\text{Apabila } p = 2 \text{ dan } q = x,$$

$$x = \frac{12}{2^2} = \frac{12}{4} = 3$$

$$10 \quad y \propto \frac{1}{x^3}$$

$$y = \frac{k}{x^3} \quad [k \text{ ialah pemalar.}]$$

$$y = 5 \text{ apabila } x = 2$$

$$5 = \frac{k}{2^3}$$

$$k = 40$$

$$y = \frac{40}{x^3}$$

$$\text{Apabila } y = \frac{5}{8},$$

$$\frac{5}{8} = \frac{40}{x^3}$$

$$x^3 = 40 \times \frac{8}{5}$$

$$x^3 = 64$$

$$x = 4$$

$$11 \text{ (a)} \quad b \propto \frac{1}{j^3}$$

$$b = \frac{k}{j^3} \quad [k \text{ ialah pemalar.}]$$

$$\text{Apabila } j = 2, b = 500,$$

$$500 = \frac{k}{2^3}$$

$$k = 4\,000$$

$$b = \frac{4\,000}{j^3}$$

$$\text{(b) (i) Apabila } j = 5,$$

$$b = \frac{4\,000}{5^3}$$

$$b = 32$$

$$\text{(ii) Apabila } b = 4\,000$$

$$4\,000 = \frac{4\,000}{j^3}$$

$$j^3 = 1$$

$$j = 1 \text{ cm}$$

$$12 \text{ (a)} \quad T \propto \frac{1}{d^2}$$

$$T = \frac{k}{d^2} \quad [k \text{ ialah pemalar.}]$$

$$T = 3.84, \text{ apabila } d = 2$$

$$3.84 = \frac{k}{2^2}$$

$$k = 15.36$$

$$T = \frac{15.36}{d^2}$$

$$\text{(b) Apabila } T = 6,$$

$$6 = \frac{15.36}{d^2}$$

$$d^2 = \frac{15.36}{6}$$

$$d^2 = 2.56$$

$$d = 1.6 \text{ cm}$$

$$13 \quad w \propto \frac{x^2}{\sqrt{y}}$$

$$w = \frac{kx^2}{\sqrt{y}} \quad [k \text{ ialah pemalar.}]$$

$$\text{Diberi } w = 4, x = 2 \text{ dan } y = 9,$$

$$4 = \frac{k(2^2)}{\sqrt{9}}$$

$$k = 3$$

$$w = \frac{3x^2}{\sqrt{y}}$$

$$\text{Apabila } w = 8, x = 4 \text{ dan } y = p,$$

$$8 = \frac{3(4)^2}{\sqrt{p}}$$

$$\sqrt{p} = 6$$

$$p = 36$$

$$14 \quad p \propto \frac{1}{q\sqrt{r}}$$

$$p = \frac{k}{q\sqrt{r}}$$

$$\text{Apabila } p = \frac{2}{3}, q = 2 \text{ dan } r = 9,$$

$$\frac{2}{3} = \frac{k}{2\sqrt{9}} \quad [k \text{ ialah pemalar.}]$$

$$\frac{2}{3} = \frac{k}{6}$$

$$k = 4$$

$$p = \frac{4}{q\sqrt{r}}$$

$$\text{Apabila } p = \frac{1}{9}, q = 4 \text{ dan } r = n,$$

$$\frac{1}{9} = \frac{4}{4\sqrt{n}}$$

$$\sqrt{n} = 9$$

$$n = 81$$

$$15 \quad p \propto \frac{\sqrt{r}}{q^2}$$

$$p = \frac{k\sqrt{r}}{q^2} \quad [k \text{ ialah pemalar.}]$$

Apabila $p = 3$, $q = 2$ dan $r = 9$,

$$3 = \frac{k\sqrt{9}}{2^2}$$

$$3 = \frac{k(3)}{3^2}$$

$$k = 9$$

$$p = \frac{9\sqrt{r}}{q^2}$$

Apabila $p = \frac{4}{9}$, $q = k$ dan $r = 16$,

$$\frac{4}{9} = \frac{9\sqrt{16}}{k^2}$$

$$k^2 = 36 \times \frac{9}{4}$$

$$k^2 = 81$$

$$k = \pm 9$$

$$16 \quad V \propto AR$$

$$V = kAR$$

Apabila $V = 8$, $A = 4$ dan $R = 2$,

$$8 = k(4)(2)$$

$$k = 1$$

$$V = AR$$

(a) Apabila $A = 5$ dan $R = 3$,

$$V = 5(3) = 15 \text{ volt}$$

(b) Apabila $V = 16$ dan $R = 4$,

$$16 = A(4)$$

$$A = 4 \text{ ampere}$$

(c) Apabila $A = 6$ dan $V = 3$,

$$3 = 6R$$

$$R = 0.5 \text{ ohm}$$

$$17 \text{ (a)} \quad F \propto \frac{Mm}{r^2}$$

$$F = G \frac{Mm}{r^2}$$

$$\text{(b)} \quad F = (6.670 \times 10^{-11}) \left[\frac{5.972 \times 10^{24} \times 7.348 \times 10^{22}}{(3.844 \times 10^8)^2} \right]$$

$$F = 1.981 \times 10^{20} \text{ N}$$