

PAPER 1

ANALYSIS OF THE 2012 – 2018 SPM PAPERS

TOPIC	NUMBER OF QUESTIONS						
	2012	2013	2014	2015	2016	2017	2018
Algebraic Expressions II & III	2	1	2	2	2	2	2

SPM 2012 Question 19

- 1 $(p - q)(p + q) + p(p - q) =$
- A $2p^2 - q^2 - q$
 B $2p^2 - q^2 - pq$
 C $2p^2 - q^2 + pq$
 D $2p^2 + q^2 - pq$

SPM 2012 Question 20

- 2 Express $\frac{2nm}{p} \times \frac{pq + pm}{nm^2}$ as a single fraction in its simplest form.

Ungkapkan $\frac{2nm}{p} \times \frac{pq + pm}{nm^2}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $2(q + 1)$
 B $2(q + p)$
 C $\frac{2q + pm}{m}$
 D $\frac{2q + 2m}{m}$

SPM 2013 Question 19

- 3 $(2y - 3x)(x - 4y) =$
- A $-3x^2 + 14xy + 8y^2$
 B $-3x^2 - 10xy + 8y^2$
 C $-3x^2 - 10xy - 8y^2$
 D $-3x^2 + 14xy - 8y^2$

SPM 2014 Question 19

- 4 $2(x - 3y)^2 + xy =$
- A $2x^2 + xy + 9y^2$
 B $2x^2 + 4xy + 18y^2$
 C $2x^2 - 5xy + 9y^2$
 D $2x^2 - 11xy + 18y^2$

SPM 2014 Question 20

- 5 Express $\frac{2 + 3m}{6} - \frac{4 - m}{6}$ as a single fraction in its simplest form.

Ungkapkan $\frac{2 + 3m}{6} - \frac{4 - m}{6}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $\frac{m - 1}{3}$
 B $\frac{2m - 1}{3}$
 C $\frac{4m - 1}{3}$
 D $\frac{2m - 2}{3}$

SPM 2015 Question 19

- 6 Factorise completely $3p^3 - 12p$.

Faktorkan selengkapnya $3p^3 - 12p$.

- A $3p(-3p^2)$
 B $3p(p^2 - 12)$
 C $3p(p - 2)(p - 2)$
 D $3p(p - 2)(p + 2)$

SPM 2015 Question 20

- 7 Express $\frac{mn^2 - 9m}{mn} \div \frac{mn + 3m}{5n}$ as a single fraction in its simplest form.

Ungkapkan $\frac{mn^2 - 9m}{mn} \div \frac{mn + 3m}{5n}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $\frac{5(n + 3)}{m}$ C $\frac{m}{5(n - 3)}$
 B $\frac{5(n - 3)}{m}$ D $\frac{m}{5(n + 3)}$

SPM 2016 Question 18

- 8 $4 - 3(2 - y)^2 =$
- A $4 + y^2$
 B $-8 + 3y^2$
 C $4 - 4y + y^2$
 D $-8 + 12y - 3y^2$

SPM 2016 Question 20

- 9 Express $\frac{3}{4r} - \frac{6r-1}{8r}$ as a single fraction in its simplest form.

Ungkapkan $\frac{3}{4r} - \frac{6r-1}{8r}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $\frac{1-3r}{4r}$
 B $\frac{2-3r}{4r}$
 C $\frac{5-6r}{8r}$
 D $\frac{7-6r}{8r}$

SPM 2017 Question 19

- 10 $(p-q)(p+q) - (p+q)^2 =$
- A $-2pq - 2q^2$
 B $2pq - 2q^2$
 C $-2q^2$
 D $2pq$

SPM 2017 Question 20

- 11 Express $\frac{1}{h-r} - \frac{2h}{h^2-r^2}$ as a single fraction in its simplest form.

Ungkapkan $\frac{1}{h-r} - \frac{2h}{h^2-r^2}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $\frac{-h+r}{h^2-r^2}$
 B $\frac{-h-r}{h^2-r^2}$
 C $\frac{h^2-r^2-2h}{h^2-r^2}$
 D $\frac{-h^2-r^2+2hr}{h^2-r^2}$

SPM 2018 Question 17

- 12 Express $\frac{pq-p^3q}{1-p^2} \div \frac{q}{2p+2}$ in its simplest form.

Ungkapkan $\frac{pq-p^3q}{1-p^2} \div \frac{q}{2p+2}$ dalam bentuk termudah.

- A $2p(p^2+1)$
 B $2p(p+1)$
 C $\frac{1}{2(p+1)}$
 D $\frac{1}{2p(p+1)}$

SPM 2018 Question 19

- 13 Express $\frac{x}{3} - \frac{x+2}{5}$ as a single fraction in its simplest form.

Ungkapkan $\frac{x}{3} - \frac{x+2}{5}$ sebagai satu pecahan tunggal dalam bentuk termudah.

- A $\frac{2(x-1)}{15}$
 B $\frac{2(x+1)}{15}$
 C $\frac{2(x+3)}{15}$
 D $\frac{2(x-3)}{15}$

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Algebraic Formulae	1	1	1	1	1	1	–

SPM 2012 Question 21

- 1 Given $p = 5q - r$, express q in terms of p and r .
Diberi $p = 5q - r$, ungkapkan q dalam sebutan p dan r .

A $q = \frac{p+r}{5}$ C $q = \frac{p}{5} + r$
 B $q = \frac{p-r}{5}$ D $q = \frac{p}{5} - r$

SPM 2013 Question 20

- 2 Given $2 - 3p^2 = 2(m + 3p^2)$, express p in terms of m .
Diberi $2 - 3p^2 = 2(m + 3p^2)$, ungkapkan p dalam sebutan m .

A $p = \frac{\sqrt{2-2m}}{9}$ C $p = \frac{\sqrt{2-2m}}{3}$
 B $p = \frac{\sqrt{2m-2}}{9}$ D $p = \frac{\sqrt{2m-2}}{3}$

SPM 2014 Question 21

- 3 Given $h = \frac{k^3}{4} + 6$, express k in terms of h .
Diberi $h = \frac{k^3}{4} + 6$, ungkapkan k dalam sebutan h .

A $k = \frac{4h-24}{3}$ C $k = \sqrt[3]{4h-24}$
 B $k = \frac{4h-6}{3}$ D $k = \sqrt[3]{4h-6}$

SPM 2015 Question 21

- 4 Given $T = 3 + 2(n - 1)$, express n in terms of T .
Diberi $T = 3 + 2(n - 1)$, ungkapkan n dalam sebutan T .

A $n = \frac{T+1}{2}$ C $n = \frac{T-1}{2}$
 B $n = \frac{T+2}{2}$ D $n = \frac{T-2}{2}$

SPM 2016 Question 19

- 5 Given $v = \pi r^2 h$.
Express r in terms of v and h .
Diberi $v = \pi r^2 h$.
Ungkapkan r dalam sebutan v dan h .

A $\frac{\sqrt{v}}{\pi h}$
 B $\sqrt{\frac{v}{\pi h}}$
 C $\left(\frac{v}{\pi h}\right)^2$
 D $\frac{v^2}{\pi h}$

SPM 2017 Question 21

- 6 Given that $\frac{3r^2 + p}{2} = 2(3 + 4p)$, express p in terms of r .

Diberi bahawa $\frac{3r^2 + p}{2} = 2(3 + 4p)$, ungkapkan p dalam sebutan r .

A $p = \frac{r^2 + 4}{5}$
 B $p = \frac{r^2 - 4}{5}$
 C $p = \frac{3r^2 - 12}{17}$
 D $p = \frac{3r^2 + 2}{17}$

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	2012	2013	2014	2015	2016	2017	2018
Indices	2	2	1	2	2	2	1

SPM 2012 Question 23

1 $\frac{b^2}{3a^2} =$

A $3(ab)^{-2}$

C $\frac{(ab)^{-2}}{3}$

B $3a^{-2}b^2$

D $\frac{a^{-2}b^2}{3}$

SPM 2012 Question 24

2 Simplify:

Ringkaskan:

$$\frac{m^{\frac{3}{4}} \times \sqrt{m}}{m^{\frac{1}{4}}}$$

A m

C $m^{\frac{3}{2}}$

B m^5

D $m^{\frac{5}{2}}$

SPM 2013 Question 22

3 $\left(\frac{3}{4}\right)^{-2} =$

A $\frac{4}{9}$

C $\frac{9}{4}$

B $\frac{9}{16}$

D $\frac{16}{9}$

SPM 2013 Question 23

4 $(3^6 \times 27)^{\frac{1}{3}} \div (k^2)^{\frac{1}{2}}$

A $81k$

B $27k$

C $\frac{81}{k}$

D $\frac{27}{k}$

SPM 2014 Question 24

5 Simplify:

Ringkaskan:

$$\frac{p^2 q^2 \times (27p^3 q^3)^{\frac{1}{3}}}{p}$$

A $3p^2 q^3$

B $3p^4 q^5$

C $9p^2 q^3$

D $9p^4 q^5$

SPM 2015 Question 23

6 $\frac{1}{\sqrt[3]{m}} =$

A $\frac{1}{3}m^2$

C $m^{-\frac{1}{3}}$

B $\frac{1}{3}m^{-2}$

D $m^{\frac{1}{3}}$

SPM 2015 Question 24

7 Simplify:

Ringkaskan:

$$\left[\frac{27p^3}{q^6}\right]^{\frac{1}{3}} \div p^2 q^3$$

A $\frac{3}{pq^5}$

B $\frac{3}{pq^3}$

C $\frac{3p^5}{q^3}$

D $\frac{3p^3}{q^3}$

SPM 2016 Question 22

8. $\left(\frac{3m}{n}\right)^{-2} =$

- A $\frac{n^2}{9m^2}$
- B $\frac{9m^2}{n^2}$
- C $\frac{3m^2}{n^2}$
- D $\frac{n}{3m^2}$

SPM 2016 Question 23

9 Simplify:
Ringkaskan:

$$\left(\frac{a^2b^4}{a^{-1}}\right)^{\frac{1}{2}} \times a^{\frac{3}{2}}b^{\frac{1}{2}}$$

- A $a^2b^{\frac{5}{2}}$
- B $a^2b^{\frac{9}{2}}$
- C $a^3b^{\frac{5}{2}}$
- D $a^3b^{\frac{9}{2}}$

SPM 2017 Question 23

10 Given that $n = \left(3^{-2} \times 81^{\frac{3}{4}}\right)$, find the value of n^2 .

Diberi bahawa $n = \left(3^{-2} \times 81^{\frac{3}{4}}\right)$, cari nilai n^2 .

- A 18
- B 9
- C -6
- D -9

SPM 2017 Question 24

11 Simplify:
Perudahkan:

$$\left[\frac{r^{10} \times (4s^8)^{\frac{1}{2}}}{(r^{16}s^{24})^{\frac{1}{4}}} \right]^3$$

- A $\frac{4s^6}{r^2}$
- B $\frac{8r^6}{s^6}$
- C $\frac{8r^{18}}{s^6}$
- D $\frac{64}{r^{18}s^6}$

SPM 2018 Question 22

12 $\left(\frac{1}{5}\right)^{-\frac{2}{3}} =$

- A $\sqrt[3]{5}$
- B $\sqrt{5^3}$
- C $\sqrt{25^3}$
- D $\sqrt[3]{25}$

Mode = 24
 Difference between median score and mode score
 = 24 - 23
 = 1

CHAPTER

4

Algebraic Expressions II & III

Paper 1

1 B

Review: Expand $(p - q)(p + q)$ and $p(p - q)$ first. Then simplify the expression.

$$(p - q)(p + q) + p(p - q) = p^2 + pq - pq - q^2 + p^2 - pq \\ = 2p^2 - q^2 - pq$$

2 D

Review: Factorise $pq + pm$ as $p(q + m)$. Then multiply the two algebraic fractions and simplify them.

$$\frac{2nm}{p} \times \frac{pq + pm}{nm^2} = \frac{2nm}{p} \times \frac{p(q + m)}{nm^2} \\ = \frac{2(q + m)}{m} \\ = \frac{2q + 2m}{m}$$

3 D

Review: Expanding the brackets.

$$(2y - 3x)(x - 4y) = 2xy - 8y^2 - 3x^2 + 12xy \\ = -3x^2 + 14xy - 8y^2$$

4 D

Review: Expand $(x - 3y)^2$ and then $2(x - 3y)^2$. Simplify the expression.

$$2(x - 3y)^2 + xy = 2(x - 3y)(x - 3y) + xy \\ = 2(x^2 - 3xy - 3xy + 9y^2) + xy \\ = 2x^2 - 12xy + 18y^2 + xy \\ = 2x^2 - 11xy + 18y^2$$

5 B

Review: Carry out subtraction.

$$\frac{2 + 3m}{6} - \frac{4 - m}{6} = \frac{2 + 3m - (4 - m)}{6} \\ = \frac{2 + 3m - 4 + m}{6} \\ = \frac{4m - 2}{6} \\ = \frac{2(2m - 1)}{6} \\ = \frac{2m - 1}{3}$$

6 D

Review: Factorise and then use $a^2 - b^2 = (a + b)(a - b)$

$$3p^3 - 12p = 3p(p^2 - 4) \\ = 3p(p^2 - 2^2) \\ = 3p(p + 2)(p - 2)$$

7 B

Review: Change the division into multiplication. Factorise and then simplify.

$$\frac{mn^2 - 9m}{mn} \div \frac{mn + 3m}{5n} \\ = \frac{mn^2 - 9m}{mn} \times \frac{5n}{mn + 3m} \\ = \frac{m(n^2 - 9)}{mn} \times \frac{5n}{m(n + 3)} \\ = (n + 3)(n - 3) \times \frac{5}{m(n + 3)} \\ = \frac{5(n - 3)}{m}$$

8 D

Review:

$$4 - 3(2 - y)^2 = 4 - 3(2 - y)(2 - y) \\ = 4 - 3(4 - 4y + y^2) \\ = 4 - 12 + 12y - 3y^2 \\ = -8 + 12y - 3y^2$$

9 D

Review:

$$\frac{3}{4r} - \frac{6r - 1}{8r} = \frac{3(2)}{4r(2)} - \frac{6r - 1}{8r} \\ = \frac{6 - (6r - 1)}{8r} \\ = \frac{6 - 6r + 1}{8r} \\ = \frac{7 - 6r}{8r}$$

10 A

Review: Expand $(p - q)(p + q)$ and $(p + q)^2$, then simplify the expression.

$$p^2 - q^2 - (p^2 + 2pq + q^2) \\ = p^2 - q^2 - p^2 - 2pq - q^2 \\ = -2pq - 2q^2$$

11 A

Review: Get the denominator, then expand.

$$\frac{1}{h - r} - \frac{2h}{h^2 - r^2} \\ = \frac{h^2 - r^2 - 2h(h - r)}{(h - r)(h^2 - r^2)} \\ = \frac{h^2 - r^2 - 2h^2 + 2hr}{(h - r)(h^2 - r^2)} \\ = \frac{-h^2 + 2hr - r^2}{(h - r)(h^2 - r^2)} \\ = \frac{-(h^2 - 2hr + r^2)}{(h - r)(h^2 - r^2)} \\ = \frac{-(h - r)^2}{(h - r)(h^2 - r^2)} \\ = \frac{-(h - r)}{(h - r)(h + r)} \\ = \frac{1}{h + r}$$

12 B

Review:

$$\begin{aligned} & \frac{pq - p^3q}{1 - p^2} \div \frac{q}{2p + 2} \\ &= \frac{pq - p^3q}{1 - p^2} \times \frac{2p + 2}{q} \\ &= \frac{pq(1 - p^2)}{1 - p^2} \times \frac{2(p + 1)}{q} \\ &= \frac{2p \cdot q(p + 1)}{q} \\ &= 2p(p + 1) \end{aligned}$$

13 D

Review:

$$\begin{aligned} & \frac{x}{3} - \frac{x + 2}{5} \\ &= \frac{x(5) - (x + 2)(3)}{3(5) \cdot 5(3)} \\ &= \frac{5x - (3x + 6)}{15} \\ &= \frac{5x - 3x - 6}{15} \\ &= \frac{2x - 6}{15} \\ &= \frac{2(x - 3)}{15} \end{aligned}$$

CHAPTER

5

Algebraic Formulae

Paper 1

1 A

Review: Rearrange the equation so that $5q$ is on the left hand side. Divide both sides of the equation by 5.

$$\begin{aligned} p &= 5q - r \\ 5q &= p + r \\ q &= \frac{p + r}{5} \end{aligned}$$

2 C

$$\begin{aligned} 2 - 3p^2 &= 2(m + 3p^2) \\ 2 - 3p^2 &= 2m + 6p^2 \\ 2 - 2m &= 9p^2 \\ \sqrt{p^2} &= \sqrt{\frac{2 - 2m}{9}} \\ p &= \frac{\sqrt{2 - 2m}}{3} \end{aligned}$$

3 C

Review: Multiply both sides of the equation by 4. Make k^3 as the subject of the formula. Then take cube roots on both sides of equation.

$$\begin{aligned} h &= \frac{k^3}{4} + 6 \\ 4h &= k^3 + 24 \\ \sqrt[3]{4h} &= \sqrt[3]{k^3 + 24} \\ k &= \sqrt[3]{4h - 24} \end{aligned}$$

4 C

Review: Expand the bracket and rearrange. Make n as the subject of the formula.

$$\begin{aligned} T &= 3 + 2(n - 1) \\ &= 3 + 2n - 2 \\ T &= 1 + 2n \\ 2n &= T - 1 \\ n &= \frac{T - 1}{2} \end{aligned}$$

5 B

Review:

$$\begin{aligned} v &= \pi r^2 h \\ \sqrt{r^2} &= \sqrt{\frac{v}{\pi h}} \\ r &= \sqrt{\frac{v}{\pi h}} \end{aligned}$$

6 B

Review: Cross multiple first, then rearrange the equation so that p as the subject of the formula.

$$\begin{aligned} \frac{3r^2 + p}{2} &= 2(3 + 4p) \\ 3r^2 + p &= 4(3 + 4p) \\ 3r^2 + p &= 12 + 16p \\ 16p - p &= 3r^2 - 12 \\ 15p &= 3(r^2 - 4) \\ p &= \frac{3(r^2 - 4)}{15} \\ &= \frac{r^2 - 4}{5} \end{aligned}$$

CHAPTER

6

Indices

Paper 1

1 D

$$\begin{aligned} \text{Review: } \frac{1}{a^m} &= a^{-m} \\ \frac{b^2}{3a^2} &= \frac{a^{-2}b^2}{3} \end{aligned}$$

2 A

$$\begin{aligned} \text{Review: } \sqrt{m} &= m^{\frac{1}{2}} \\ a^m \times a^n &= a^{m+n} \text{ and } a^m \div a^n = a^{m-n} \end{aligned}$$

$$\begin{aligned} \frac{m^{\frac{3}{4}} \times \sqrt{m}}{m^{\frac{1}{4}}} &= \frac{m^{\frac{3}{4}} \times m^{\frac{1}{2}}}{m^{\frac{1}{4}}} \\ &= m^{\frac{3}{4} + \frac{1}{2} - \frac{1}{4}} \\ &= m^{\frac{4}{4}} = m \end{aligned}$$

3 D

$$\begin{aligned} \left(\frac{3}{4}\right)^{-2} &= \frac{1}{\left(\frac{3}{4}\right)^2} \\ &= \frac{1}{\frac{9}{16}} = \frac{16}{9} \end{aligned}$$

4 D

$$\begin{aligned} (3^6 \times 27)^{\frac{1}{3}} \div (k^2)^2 &= 3^2 \times 27^{\frac{1}{3}} \div k \\ &= 9 \times (3^3)^{\frac{1}{3}} \div k \\ &= 9 \times 3 \div k \\ &= \frac{27}{k} \end{aligned}$$

5 A

Review: Use $(p^m q^n)^p = p^{mp} q^{np}$

$$\begin{aligned} \frac{p^2 q^2 \times (27 p^3 q^3)^{\frac{1}{3}}}{p} &= \frac{p^2 q^2 \times 3 \times p \times q}{p} \\ &= p^2 q^2 \times 3q \\ &= 3p^2 q^3 \end{aligned}$$

6 C

Review: $\sqrt[3]{a} = a^{\frac{1}{3}}$ and $\frac{1}{a} = a^{-1}$

$$\begin{aligned} \frac{1}{\sqrt[3]{m}} &= \frac{1}{m^{\frac{1}{3}}} \\ &= m^{-\frac{1}{3}} \end{aligned}$$

7 A

Review: $(a^m)^n = a^{mn}$

$$\begin{aligned} \left[\frac{27p^3}{q^6}\right]^{\frac{1}{3}} \div p^2 q^3 &= \frac{27^{\frac{1}{3}} (p^3)^{\frac{1}{3}}}{q^{\frac{6}{3}}} \times \frac{1}{p^2 q^3} \\ &= \frac{3p (q^{\frac{6}{3}})^{\frac{1}{3}}}{q^2} \times \frac{1}{p^2 q^3} \\ &= \frac{3}{pq^5} \end{aligned}$$

8 A

Review:

$$\begin{aligned} \left(\frac{3m}{n}\right)^{-2} &= \frac{1}{\left(\frac{3m}{n}\right)^2} \\ &= \frac{1}{\frac{9m^2}{n^2}} \\ &= \frac{n^2}{9m^2} \end{aligned}$$

9 C

Review:

$$\begin{aligned} \left(\frac{a^2 b^4}{a^{-1}}\right)^{\frac{1}{2}} \times a^{\frac{3}{2}} b^{\frac{1}{2}} &= (a^2 b^4 a)^{\frac{1}{2}} \times a^{\frac{3}{2}} b^{\frac{1}{2}} \\ &= (a^3 b^4)^{\frac{1}{2}} \times a^{\frac{3}{2}} b^{\frac{1}{2}} \\ &= a^{\frac{3}{2}} b^2 \times a^{\frac{3}{2}} b^{\frac{1}{2}} \\ &= a^{\frac{3}{2} + \frac{3}{2}} b^{2 + \frac{1}{2}} \\ &= a^3 b^{\frac{5}{2}} \end{aligned}$$

10 B

Review: $(a^m)^n = a^{mn}$ and $a^m \times a^n = a^{(m+n)}$

$$\begin{aligned} n &= 3^{-2} \times 3^{(4 \times \frac{3}{4})} \\ n &= 3^{-2} \times 3^3 \\ n &= 3^{-2+3} \\ n &= 3^1 \\ n^2 &= 3^2 \\ &= 9 \end{aligned}$$

11 C

Review: $(a^m b^n)^p = a^{mp} b^{pn}$ and $\frac{a^m}{a^n} = a^{(m-n)}$

$$\begin{aligned} \left[\frac{r^{10} \times (4s^8)^{\frac{1}{2}}}{(r^{16} s^{24})^{\frac{1}{4}}}\right]^3 &= \left[\frac{r^{10} \times 4^{\frac{1}{2}} s^4}{r^4 s^6}\right]^3 \\ &= (r^{10-4} \times 2 \times s^{4-6})^3 \\ &= \left(\frac{2r^6}{s^2}\right)^3 \\ &= \frac{2^3 r^{6 \times 3}}{s^2} \\ &= \frac{8r^{18}}{s^6} \end{aligned}$$

12 D

Review:

$$\begin{aligned} \left(\frac{1}{5}\right)^{-\frac{2}{3}} &= \left(\frac{5}{1}\right)^{\frac{2}{3}} \\ &= 5^2 \left(\frac{1}{3}\right) \\ &= 25^{\frac{1}{3}} \\ &= \sqrt[3]{25} \end{aligned}$$